* UMASS/AMHERST *

312066 0103 8750 1

UNIVERSITY OF MASSACHUSETTS

GOODELL LIBRARY

SB
45
B17
V.2

v.2

THIS BOOK-PLATE IS A GIFT OF DR. WILLIAM GOODELL

This book may be kept out

TWO WEEKS

only, and is subject to a fine of **TWO CENTS** a day thereafter. It will be due on the day indicated below.

NOV [illegible]

IL: 9096710 5/6

CARD

Cyclopedia of American Horticulture

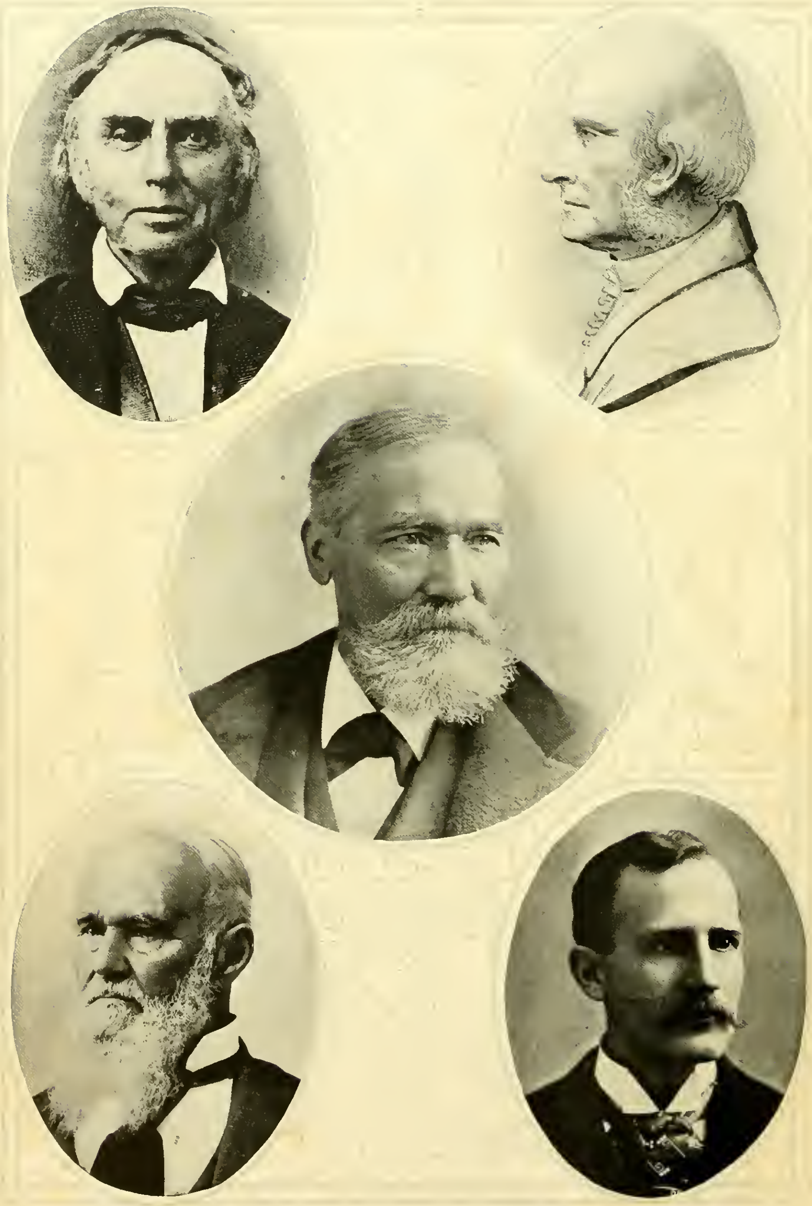


Plate X. Prominent American Horticulturists

CYCLOPEDIA OF AMERICAN HORTICULTURE

COMPRISING SUGGESTIONS FOR CULTIVATION OF HORTICULTURAL PLANTS, DESCRIPTIONS OF THE SPECIES OF FRUITS, VEGETABLES, FLOWERS AND ORNAMENTAL PLANTS SOLD IN THE UNITED STATES AND CANADA, TOGETHER WITH GEOGRAPHICAL AND BIOGRAPHICAL SKETCHES

AND

A SYNOPSIS OF THE VEGETABLE KINGDOM

BY

L. H. BAILEY

ASSISTED BY

WILHELM MILLER, PH.D.

Associate Editor

AND MANY EXPERT CULTIVATORS AND BOTANISTS

Illustrated with nearly Three Thousand Engravings
and One Hundred and Forty-five Full-page Half-tones

IN SIX VOLUMES—VOLUME II
CAME.-FLOW.

FOURTH EDITION

New York
DOUBLEDAY, PAGE & COMPANY
1906

The rights of reproduction and of translation are strictly reserved

F152
v.1

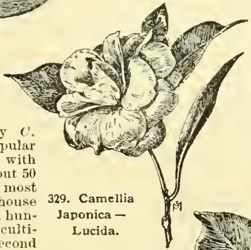
Copyright, 1900, 1901, 1902
By THE MACMILLAN COMPANY

Copyright, 1906
By THE MACMILLAN COMPANY

Mount Pleasant Press
J. Horace McFarland Co.
Harrisburg, Pa.

CAMÈLLIA (after George Joseph Kamel or Camellus, a Moravian Jesuit, who traveled in Asia in the seventeenth century). *Ternstrœmiàceæ.* Evergreen trees or shrubs: lvs. alternate, short-petioled, serrate: fls. large, axillary or terminal, usually solitary, white or red; sepals and petals 5 or more: stamens numerous, connate at the base: fr. a 3-5-celled, dehiscent capsule, with large, globular or ovoid seeds. About 10 species in trop. and subtrop. Asia, divided into the subgenera *Eucamellia* and *Thea*, considered by some to be distinct genera, by some all united under Thea. The species of Eucamellia, especially *C. Japonica*, are popular decorative shrubs, with very showy fls. About 50 years ago one of the most appreciated greenhouse shrubs, and several hundred varieties were cultivated. Of the second subgenus, *C. Thea* is cultivated in nearly all subtropical countries and in the mountainous regions of the tropics for its leaves, which yield the well-known tea, and are an article of great commercial importance. There is a monograph of this genus by Seemann in Trans. Linn. Soc. XXII. p. 337-352. Illustrated monographs of the horticultural varieties are: Curtis, Monogr. of the genus Camellia (1819); Baumann, Bollweiler Camelliensammlung (1828); Chandler, Camelliеæ (1831); Berlèse, Monogr. du genre Camellia a (1839); Verschaffelt, Nouvelle Monographie du Camellia (1848-60): the last with 576 and the foregoing with 300 colored plates.

328. Camellia Japonica — Abby Wilder.



329. Camellia Japonica — Lucida.

A. *Fls. sessile, erect, terminal and axillary; calyx-lobes deciduous. Camellia proper.*

Japònica, Linn. Figs. 328-331. Shrub or tree, sometimes to 40 ft., glabrous: lvs. very shining and dark green above, ovate or elliptic, acuminate, sharply serrate, 2-4 in. long: fls. red in the type, 3-5 in. across; petals 5-7, roundish. China, Japan. B.M. 42. S.Z. 82. F.S. 20:2121.—Var. **álba**, Lodd. Fls. white. L.B.C. 7:636. Gn. 54, p. 243. Var. **álba plèna**, Lodd. Fls. white, double. L.B C. 3:269. Var. **anemoniflòra**, Curtis. Fls. red, with 5 large petals, the stamens changed into numerous smaller and narrow petals; the whole fl. resembling that of a double Anemone. L.B.C. 537. B.M. 1654. For the numerous other garden forms, see the above mentioned monographs; also, Flore des Serres, L'Illustration Horticole, and other older horticultural publications contain a large number of varieties with illustrations.

reticulàta, Lindl. Large shrub, glabrous: lvs. dull green, not shining above, reticulate, flat, elliptic-oblong, acuminate, serrate, 3-5 in. long: fls. 5-7 in. across, purplish rose; petals 15-20, obovate, loosely arranged. China. B.R. 13:1078. B.M. 2784. P.M. 3:101.—Var. **plèna**, Hort. Fls. with twice as many petals, and more regularly arranged. B.M. 4976. F.S. 12:1279-80.

Sasánqua, Thunb. Shrub of loose, straggling habit, with the branches pubescent when young: lvs. elliptic, bluntly pointed at the apex, crenate-serrate, shining, dark green and hairy on the midrib above, 1¾-3 in. long: fls. 1½-2 in. across, white; petals 5 or more, obovate or oblong. China, Japan. Gn. 54:1189. S.Z. 83 (except the red vars.).—Var. **semiplèna**, Hort. Fls. semidouble, white. B.R. 1:12 and 13:1091. Var. **anemoniflòra**, Seem. Fls. large, double, outer petals white, inner ones much smaller, yellow. B.M. 5152. Var. **oleifera**, Rehd. (*C. oleifera*, Lindl.). Of more robust habit, with lvs. and the single white fls. larger than in the type. B.R. 11:942. L.B.C. 11:1065.

AA. *Fls. pedicelled, nodding, mostly axillary: calyx-teeth persistent. Thea.*

Thèa, Link. (*C. theifera*, Griff. *Thèa Sinénsis*, Linn.). TEA. Shrub, sometimes tree, to 30 ft.: lvs. elliptic-lanceolate or obovate-lanceolate, acuminate, serrate, glabrous, sometimes pubescent beneath: fl. white, fragrant, 1-1½in. broad; petals 5. China, India.—Usually two varieties are distinguished: Var. **Bohèa** (*Thèa Bohèa*, Linn.). Lvs. elliptic, dark green, to 3 in. long: branches erect. B.M. 998. L.B.C. 3: 226. Var. **viridis** (*Thèa víridis*, Linn.). Lvs. pale green, lanceolate, to 5 in. long: branches spreading. B.M. 3148. L.B.C. 3:227 and 19:1828. The black tea, however, and green tea of commerce do not come from certain varieties, but are the result of different treatment of the leaves after gathering.

C. axillàris, Roxb.=Gordonia anomala.—*C. drupifera*, Lour. (C. Kissi, Wall.). Shrub to 8 ft.: lvs. elliptic, long acuminate: fls. 1½in. wide, fragrant, white: petals obovate. Himal., India. L.B.C. 19:1815.—*C. euryoìdes*, Lindl. (Thea euryoides, Booth). Shrub to 4 ft.: lvs. ovate-lanceolate, silky beneath: fls. white, nodding, axillary, rather small. B.R. 12:983. L.B.C. 15:1493.—*C. euryoìdes*, Hort.=C. rosiflora, var. maliflora.—*C. rosiflòra*, Hook. (C. Sasanqua, fl. rubro, Sims). Shrub: lvs. ovate, acuminate: fls. pink; petals 5, obcordate: ovary glabrous. China. B.M. 5044. Var. *maliflòra*, Rehd. (C. maliflora, Lindl.). Fls. double, pink. B.R. 7:547. L. B. C. 12:1134. B.M. 2080.

ALFRED REHDER.

Camellias are not hard to grow, either the well-known *C. Japonica* or the less common *C. Sasanqua*, and *C. Thea*, the Tea Plant. They require a coolhouse, not too dry an atmosphere, and must never suffer from dryness at the roots; a somewhat shady position is helpful, and good ventilation is essential. A night temperature of 45°-50° F. is best for them while at rest; this is also the time of blooming, but it may be increased during the period of growth; the day temperature should be from 60°-70° F. The soil for established plants should be made mainly of well-rotted sods, to which should be added some leaf-mold, rotted cow-manure, and enough sand to insure good drainage; sod and leaf-mold should be unsifted. For young plants, the Dutch growers use a rather fine soil of peat, leaf-mold and sand; the Japanese gardeners use

330. Camellia Japonica — H. A. Downing.

331. Camellia Japonica — President Clark.

AN 20 1950

a heavier soil, apparently containing some clay. The pots and tubs should be well drained with potsherds and charcoal, the drainage being protected by sphagnum to insure durability, the older plants not requiring frequent shifts. Potting should be done just before new growth starts, when the flowering is about over; the exact time can be determined by noting the beginning of the root growth, which generally precedes the expanding of the leaf-buds. The soil should be moist, not wet, and made firm. Large shifts should be avoided; in many cases, by renewing the drainage and removing the surface soil, a larger pot will be found unnecessary. After potting, the temperature may be increased, and the plants should be kept close until a new growth is established.

When the weather in May becomes settled, they should be placed in summer quarters. This may be a cool greenhouse, well shaded, or, preferably, a position in the open air, protected from sun and wind. Lath screens may be employed, or the shade of trees or fences. In any case there must be plenty of light and air. Great care must always be given to watering, but especially at this time, while they are making and ripening their growth; the dropping of flower buds in November is often the result of careless watering in summer. Plenty of water must be given to the roots, never in driblets, and the foliage should be syringed night and morning in dry weather. The forcible application of water in the form of spray not only keeps the plant in good condition, but checks mealy-bug and red-spider. In September they should be put in the cool end of the coolhouse, or they can be stored in a pit and brought in later. The Camellia is nearly hardy, but should not be exposed to actual frost. Large specimens can be planted out in a coolhouse or winter garden. They thrive wonderfully in the evenly moist soil of such a position, and give an abundant bloom at Christmas and New Year, when flowers are scarce; the foliage, too, can be freely cut, since growth under these conditions is so much improved.

Propagation is now effected by cuttings and grafts. Formerly inarching and even layering were employed. Cuttings should be made, November to January, from wood of the previous season's growth, from 1½–2 or 2½ inches long, each having from 1–3 eyes; in single-eye cuttings the leaf is left entire, in others 1 or 2 leaves are removed. Plant firmly in sharp sand, keeping them cool, well watered and carefully shaded for the first few weeks. Sometimes they will be sufficiently rooted in June for potting in thumbs, but at others they will not be ready until October. Shift on the young plants as their growth requires, never giving them too large pots; they make a surprisingly good growth when once established. Flower buds should be picked from young stock; sometimes there is trouble from blind eyes, but a new bud will eventually form. Grafting is done in November, December and January, using the improved veneer graft; a close frame is not necessary, but is often used, in which case great care must be given to watering and ventilation. If raffia is used for tying, it should be smeared with grafting wax to prevent decay; the process of uniting is lengthy. Stock can be obtained from seed or by cuttings of easily rooted varieties. Mealy-bug and red-spider can be avoided by proper syringing; thrips and aphis are kept down by tobacco fumigation; scale must be checked by washing and spraying; a troublesome leaf-eating insect is only removed by hand picking.

Consult Practical Camellia Culture, by Robert Halliday, Baltimore, 1880. Illus. The only other American book on Camellias is an American edition of The Abbe Berlese's Monography of the Genus Camellia, by Gen. Dearborn; Boston, 1838. For a list of varieties, see also Nouvelle Iconographie des Camellias, Amb. Verschaffelt Fils; Ghent, 1856–60. Illus. B. M. Watson.

Camellias are general favorites with most people, and, when well-grown, have few equals among hardwooded, cool, greenhouse plants. They may be propagated by seeds, cuttings, layering, grafting or inarching; the two latter methods are best for the double forms, as they succeed better when grafted or inarched on the single forms than on their own roots, the operation being performed immediately after the flowering season, or just as soon as new growth is about to commence, and the method known as "side-grafting" is best if this means of propagation is used. The single species are best propagated by seeds, if these can be obtained fresh. They should be sown in early spring, in 4-inch pots, containing a mixture of peat, leaf-mold and sand, in equal proportions. The pots should be placed in a warm temperature, where they will usually germinate in from 4 to 6 weeks. If propagated by cuttings, the half-ripened wood should be chosen, and the cuttings inserted around the edge of 4-inch pots containing a sandy, peaty mixture, pressed very firm. The pots should be placed in a shaded, close position, where an even temperature of about 60° can be maintained. The pots plunged in a half-spent hotbed would be an ideal place. If carefully attended to, they should be rooted in about two months, after which they should be potted singly, in small pots, and grown on as rapidly as possible. When of suitable height, stopping should be attended to, to induce a bushy habit. As the plants increase in size, a slightly heavier soil should be used when potting, a mixture of equal parts loam, leaf-mold and fibrous peat being most suitable. Camellias require at all seasons a good supply of water at the roots, and during the flowering season they should have an abundance. If allowed to become dry, the flower buds will fall off. They also require to be shaded from direct sunlight during the spring and summer months. A lean-to greenhouse, with a north aspect, is an ideal one in which to grow Camellias. In such a house they might be planted out, providing an abundance of air could be given during the summer; they make much larger plants and flower more freely when planted out than when grown in pots or tubs. The flowering season is usually from the beginning of February to the middle of April, if grown in ordinary cool greenhouse temperature, but they will stand gentle forcing if the flowers are wanted earlier. After flowering, they should be kept syringed to encourage the new growth, and also to keep them free from thrips. If grown in pots or tubs, they should be placed in a sheltered, shaded position outside for the summer. Edward J. Canning.

CAMEL'S THORN. See *Alhagi.*

CAMPÁNULA (Latin, *a little bell*). *Campanulàceæ.* Bell Flower. A genus of about 300 species, confined to the northern hemisphere, and containing some of the most popular garden plants, especially of hardy herbaceous perennials. The root-lvs. are usually larger than the stem-lvs., and often of different shape, and more or less transitory. Fls. blue, violet or white; calyx 5-fid; corolla 5-lobed or 5-fid; stamens 5, free; filaments wide at the base, membranaceous; stigmas 3 or 5, filiform: capsule 3–5-valved, dehiscing laterally by 3–5 valves: seeds ovate, complanate, or ovoid. Allied genera of garden value are Adenophora, Canarina, Jasione, Lightfootia, Phyteuma, Platycodon, Specularia, Symphyandra, Trachelium, and Wahlenbergia, in which genera many species originally described as Campanulas may be sought. Of these, perhaps the two best known cases are *Platycodon grandiflorum*, the "Balloon Flower," with its characteristic inflated buds, dark green, glossy leathery lvs., and *Specularia Speculum* (*C. Speculum*), "Venus' Looking-glass," a pretty annual, which grows in the grain fields of S. Europe, and is cult. for its violet fls. with a white eye. The calyx-tube of Specularia is much longer, proportionately, than in any Campanula.

Botanically, Campanulas are divided into two important groups, based on the presence or absence of calyx appendages. The subgenus Medium has the appendages, and Eucodon lacks them. In straightening out one's garden labels, the calyx appendages are one of the first things to be looked for, and they are often minute and disguised. In cultivation, Campanulas tend to become taller and more robust, less hairy, more branched, and more floriferous. A very few have white or yellowish fls., with no blue or violet forms. Any blue or violet-flowered form is likely to have white varieties, and double and semi-double forms are common in 3 or 4 of the most popular species. All flowers tend to become larger and more numerous on a stem. In cultivation, the 3-celled species are likely to have 5 stigmas instead of 3, and 5-celled capsules, often along with normally constructed fls. on the same plant. The height is the most variable feature of all, and in the scheme below *C. Carpatica* and *C. punctata* especially will seem wrongly placed to many. But the characters used by De Candolle in vol. 7, part 2 of the Prodromus are well-nigh useless to the gardener, and nothing else but a distinction of height can bring out the two important cultural groups of Campanulas, viz: Border or tall kinds, and rock-garden or dwarf kinds. The best garden monograph of Campanulas is by F. W. Meyer, in The Garden, 48: 294–299 (1895). See, also, The Garden for May 13, 1899, and 8: 173–180 (1875).

The most popular of all Campanulas is the Canterbury Bell (*C. Medium* and its var. *calycanthema*). Of all wild forms the best known is certainly *C. rotundifolia*, the true "Hairbell," or "Blue Bells of Scotland." Of the border kinds, the 6 most popular are probably *C. Medium*, *C. rotundifolia* (in its many forms), *C. pyramidalis*, *C. persicifolia*, *C. glomerata* and *C. Carpatica*. Of the rock-garden kinds, the most popular in America are possibly *C. Carpatica*, *C. cæspitosa*, and *C. rotundifolia*. The greatest curiosities are *C. punctata*, *C. macrostyla*, *C. Zoysii* and *C. rotundifolia*, var. *soldanellæflora*. For exhibition and for pot-culture, *C. pyramidalis* is most used. For pendent effects in rockeries, baskets or window boxes, *C. fragilis* is best. For edgings, *C. Carpatica* is perhaps the favorite. For large, isolated specimens, *C. pyramidalis*, the tallest species, is best. F. W. Meyer's choice of varieties and classification should be consulted by all who intend to import Campanulas. England is probably the most favored spot in the world for the culture of Bell-flowers, and the English dealers offer the greatest variety. Unfortunately, Campanula-culture is at a low ebb in America to-day, partly because the plants are less hardy here, and also because rock-gardens and amateurs' collections are less frequent than in England. Many failures with Campanulas, however, are directly traceable to ignorance of their natural term of life. Some species are perennial in the wild, but practically biennial in cultivation, and each kind must be studied by itself. Unless otherwise specified, they are presumed to be perennial. *C. Medium* may be treated as a hardy annual or biennial, or as a tender annual or biennial. The general rule is that Campanulas give the most and best flowers in the second year, but *C. Medium* can be sown indoors in early spring and set out later, with the expectation of getting the best bloom the same year. As a rule, all border Campanulas that are propagated by division should be divided every year, or every 2 years at most. Mr. Cameron recommends several species which are not described below, as they can be obtained only through botanic gardens. W. M.

The genus Campanula is a very important one, and contains many showy and useful plants. Their cultivation is very easy, and most of the strong-growing kinds can be grown in any rich, well-drained garden soil, while the dwarf kinds can be grown in the rockery, and many of them in the front row of the mixed border. Propagation is done either by division, cuttings or seeds. The genus can easily be divided into three groups—annuals, biennials, and perennials.

The annuals can be raised in the border by sowing the seeds late in April or May, or raised in the greenhouse and then transferred to the border. The best of the annuals are *C. ramosissima* and var. *alba*, *C. drabifolia*, *C. Erinus*, *C. macrostyla*, and *C. Americana*.

Of the biennials, many will flower the first season if the seeds are sown early in spring in the greenhouse and the plants put out-of-doors when the weather is favorable. One of the most important is *C. Medium* (Canterbury Bells), and its numerous varieties. Its variety *calycanthema* is so named because the calyx has broadened out into a saucer-shaped secondary flower, which is very showy and interesting. Canterbury Bells are generally raised from seeds, which can be sown in April, May or later, in pots, boxes or beds, and can then be transferred into some sheltered place where they can be slightly protected during the winter, and then transplanted in spring to their permanent places into good, rich soil, where they will make a great show if they have obtained the right treatment. A few other good biennials are *C. primulæfolia*, *C. Sibirica*, *C. spicata*, and *C. thyrsoides*.

Of the perennial species, the best border plants are the following: *C. Carpatica* and vars. *alba* and *turbinata*; *C. glomerata*, especially var. *Dahurica*; *C. lactiflora*; *C. latifolia*, especially its vars. *eriocarpa* and *macrantha*; *C. nobilis* (about 2 ft. in height); *C. persicifolia* and its numerous vars., especially the white kinds; *C. punctata* (about 1½ ft.); *C. pyramidalis*, a very showy plant when well grown, but not quite reliable in the eastern states as to hardiness; makes a good pot-plant for the cool greenhouse; *C. rapunculoides*, which spreads rapidly and must be so placed that it will not crowd out the other plants that are near it; *C. rotundifolia*; *C. Trachelium*; *C. Van Houttei*, a hybrid, and one of the best bell flowers.

The following are the best low-growing kinds for the rockery: *C. Carpatica* and its varieties, *C. Caucasica*, *C. fragilis* (which needs protection, but makes a good pot-plant), *C. pulla* in sheltered position, *C. Portenschlagiana*, *C. rotundifolia*, and *C. pusilla*. Many of the larger-growing kinds are also good for the rock garden. R. Cameron.

332. Canterbury Bells—Campanula Medium.

Alphabetical list of species described: C. alliariæfolia, 3; Allionii, 23; alpina, 26; Americana, 7; barbata, 24; Bononiensis, 16; cæspitosa, 41; Carpatica, 35; *celtidifolia*, 11; divaricata, 21; Elatines, 31; excisa, 42; *floribunda*, 36; fragilis, 29; Garganica, 30; glomerata, 10; *grandis*, 9; Grossekii, 5; *Hohenackeri*, 27; *Hostii*, 39; isophylla, 36; lactiflora, 11; *lamiifolia*, 3; *Langsdorffiana*, 40; latifolia, 15; latiloba, 9; *linifolia*, var. *Scheuchzeri*, 40; *macrantha*, 15; *macrophylla*, 3; macrostyla, 1; Medium, 2; mirabilis, 6; mollis, 25; *muralis*, 32; *nobilis*, 22; persicifolia, 8; Portenschlagiana, 32; pulla, 38; *pumila*, 41; punctata, 22; *pusilla*, 41; pyramidalis, 14; Rainerii, 33; rapunculoides, 19; Rapunculus, 44; rhomboidalis, 17; rotundifolia, 39; *Ruthenica*, 16; Sarmatica, 4; Scheuchzeri, 40; Scouleri, 37; Sibirica, 27; *Soldanella*, 39; Tenorii, 34; thyrsoides, 12; Trachelium, 18; *turbinata*, 35; *urticifolia*, 18; *Valdensis*, 40; versicolor, 20; Vidalli, 13; Waldsteiniana, 28; Zoysii, 43.

A. *Tall or Border Campanulas, a foot or more high.*

B. *Calyx with an appendage at the base of each sinus.*

C. *Capsule 5-celled: stigmas 5.*

D. *Style excessively long, the stigma an inch or more long.*

1. macróstyla, Boiss. & Heldr. Annual, 1–2 ft. high, branched from the base, hispid with rigid, spreading, scattered bristles: branches stout: lvs. scattered, small for the size of the plant, sessile, bristly on both surfaces; lower ones ovate-oblong, acute; upper ovate-lanceolate, recurved, cordate, eared at the base: calyx tube hidden by the bladdery appendages, small, broader than long: fls. solitary, on stout peduncles, 2–2½ in. broad; corolla very broad and open, pale purple without, dull purple within marked with violet and hairy toward the bottom; lobes very broad, short and acute. Mt. Taurus in Anatolia. Gn. 15:178 and 12, p. 209. B.M. 6394.—Easily told from all other species by the very long exserted style, which is brown and spindle-shaped before spreading open. Self-sown seeds sometimes wait a year before sprouting.

DD. *Style not excessively long.*

2. **Mèdium,** Linn. CANTERBURY BELLS. Fig. 332. Biennial, 1–4 ft. high: plant pilose: st. erect; lvs. sessile, ovate-lanceolate or lanceolate, crenate-dentate; petioles not marginal: raceme lax, many-fld.: calyx lobes ovate-acuminate, the appendages half as long as the ample, ovate, obtuse lobes: corolla very large, bell-shaped, inflated. S. Eu. Much less cult. than var. **calycánthema,** Hort. CUP AND SAUCER. HOSE IN HOSE. Has the calyx colored like the corolla. A fair per cent come true from seed. G.C. III. 24:65. R.H. 1897, p. 238. R.H. 1896:301. Gng. 5:88. Gn. 48, p. 295. F.S. 19, p. 152.—Canterbury Bells are probably the oldest and most popular of all Campanulas. They are most commonly treated as hardy biennials, the seed being sown in the open border, but they do not flower the first year. They can also be treated as tender annuals, the seed being sown indoors in early spring and the plants set out May 1–15. They will then flower well the first season, but always better the second year. Double forms are very popular and interesting, 1–4 perfect bells being formed one within another. The name Medium has no reference to size of plant or flower, but was the name of an old genus, now a subgenus of Campanula.

CC. *Capsule 3-celled: stigmas 3.*

DD. *Corolla with a curious projection at the base of each sinus.*

3. **alliariæfòlia,** Willd. (*C. lamiifòlia,* Bieb. *C. macrophýlla,* Sims). Fig. 333. Height 1½–2 ft.: stem erect, striate, woolly, branched only at the top: root-lvs. large, heart-shaped, crenate, tomentose: stem-lvs. on petioles which gradually shorten upwards, the highest being sessile: fls. white, nodding, on short stalks, borne singly in the axils of the floral lvs. as in *C. Sarmatica,* but the floral lvs. larger and broader: calyx a third or a fourth shorter than the corolla, with margins rolled back, and appendages less minute than in *C. Sarmatica:* corolla always white, 2 in. long, ciliated at the margin, and with characteristic tooth-like processes at the base of each sinus, which are especially interesting in the bud. Caucasus, Asia Minor. B.M. 912.—Int. into England about 1805 by Loddiges. No blue-fld. form seems to be known. Prop. by seeds.

333. Campanula alliariaefolia.

4. **Sarmática,** Ker-Gawl. Height 1–2 ft.: stem simple, striate, pubescent: lvs. remarkable for their gray color, harsh, leathery, wrinkled, tomentose, oblong-cordate, crenate, the lower long-petioled, the upper sessile: calyx with minute reflexed appendages, and a short, densely hairy tuft: fls. about 6 on a stem, nodding; corolla about 1 in. long, and 1½ in. across, marked with 5 hairy lines. Caucasus, subalpine portions. B.M. 2019. L.B.C. 6:581.

5. **Gròssekii,** Heuff. Has the habit and inflorescence of *C. Trachelium,* but the calyx is appendaged. Height 2½ ft., branching from the base, angled, pilose: lvs. hispid, the lower cordate unequally petioled, doubly crenate-serrate, the uppermost ovate-acute, narrowed into a petiole: calyx setose-ciliate, lobes lanceolate, spreading, reflexed at the apex, appendages lanceolate, a third shorter than the lobes; corolla hispid, 2 or 3 times longer than the calyx lobes: fls. large, bell-shaped, violet, in a long raceme. Hungary. Gt. 35, p. 477, f. 55.—A rare plant.

6. **mirábilis,** Correvon. Height 1 ft. or more. "The leaves forming the rosette are somewhat thick and fleshy, the lower ones spreading out to a diameter of about 9 or 12 inches, the succeeding leaves smaller and arranged in an overlapping manner." Upper lvs. ovate-serrate: fls. pale blue, hairy, 2 in. across, bell-shaped, sometimes strongly angled: raceme lax or dense. Caucasus. G.C. III. 24:33. Gt. 47:192. Gn. 54, p. 454.—Int. in Europe in 1896 by Leicthlin. Very rare and interesting. Probably a biennial rock plant. Slow from seed.

BB. *Calyx without an appendage at the base of each sinus.*

C. *Fls. rotate or wheel shaped.*

7. **Americàna,** Linn. Annual and biennial: height 3–6 ft.: st. erect, simple: lvs. thin, serrate, somewhat pilose, root-lvs. ovate-acute, subcordate, petiolate; stem-lvs. ovate-lanceolate, acuminate at both ends: calyx tube long, obconical, the teeth linear-acuminate, almost entire, spreading shorter than the 5-fid, wheel-shaped corolla: fls. light blue, 1 in. broad, in long spikes, solitary or in 3's; corolla shallow, lobes pilose outside and at the apex; style long, strongly declined and upwardly curved: capsule cylindrical, grooved. Shaded low ground western N. Y. to Iowa, south to Ga. and Ark. Rarely cult. It is possible that *Phyteuma canescens* is still cult. as *C. Americana.*

CC. *Fls. saucer-shaped or broadly bell-shaped, i. e., the tube shallower and the limbs more widely spreading than the bell-shaped.*

D. *Stem-lvs. linear-lanceolate, crenulate.*

8. **persicifòlia,** Linn. Fig. 334. Height 2–3 ft.: stem erect: lvs. glabrous, rigid, crenulate; root-lvs. lanceolate-obovate; stem-lvs. linear-lanceolate or spatulate, often 3 in. long: calyx lobes acuminate, wide at the base, entire, half as long as the broadly bell-shaped corolla: fls. blue or white, pedicelled, solitary, terminal and axillary, often 1½ in. long, 2 in. broad: capsule ovoid, 3-grooved. Eu. B.M. 397. Var. **macrántha** is a large-fld. form with fls. all along the stem. Gt. 44, p. 148. Gn. 48, p. 306. A.F. 6:383. S.H. 1:131. Var **álba grandiflòra** and var. **Báckhousei** are among the popular white-fld. forms. There are double and semi-double forms in blue and white. The double white is useful for cutting. The var. *alba grandiflora* is F. W. Meyer's favorite of all Campanulas. This species occasionally runs wild, especially in England. The lvs. are very characteristic, and, once seen, are never forgotten. Var. **coronàta,** Hort., is a semi-double white form. F.S. 7:699. The pictures in B.M. and F.S. show distinctly saucer-shaped flowers.

DD. *Stem-lvs. wider and coarsely toothed.*

9. **latíloba,** DC. (*C. grándis,* Fisch. & Mey. Height 1–1½ ft.: glabrous: stem erect, simple, terete: stem-lvs. 3–5 in. long, 4–6 lines wide, lanceolate, narrowed at both ends, crenate-serrate: calyx lobes ovate-acute, broad, entire, erect, one-half shorter than the broadly bell-shaped corolla: fls. blue, with a white form, often 2 in. wide, sessile, solitary or somewhat clustered, sometimes equaling the ovate-acute, dentate bracts. Mt. Olympus. P.M. 10:31.—Fls. like *C. persicifolia.* Quickly forms a dense carpet. Int. into Eng. about 1842 from St. Petersburgh.

CCC. *Fls. bell-shaped or tubular, not saucer-shaped.*

D. *Inflorescence a dense roundish head.*

10. **glomeràta,** Linn. One of the most variable: DeCandolle makes 8 botanical varieties. Height 1–2 ft.: typically pubescent: stem erect, simple, terete: lvs. serrulate, lower ones rough, with very short, stiff

hairs, 1½–3 in. long, 1–2 in. wide, with a cordate, ovate-oblong blade shorter than the petiole; upper ones sessile, ovate, acute: fls. in dense heads or glomes, 15–20 in the terminal heads, fewer in the axillary ones. Eu., Armenia, Persia, Siberia. B.M. 2649 is var. **speciòsa,** which has the largest fls. L.B.C. 6:505 is var. **sparsiflòra,** with much smaller clusters.—This is one of the earliest flowering and easiest of cultivation. Fls. typically dark purple, with no recorded white varieties. Var. **Dahùrica,** Hort., is probably the commonest form. Terminal clusters 3 in. or more thick; a very characteristic inflorescence. The fl. has a longer tube than *C. lactiflora* and *thyrsoides*.

DD. *Inflorescence a spike or raceme, dense or loose.*

E. *Color of fls. normally white or yellowish.*

F. *Corolla small, short-tubed.*

11. **lactiflòra,** Bieb. Height 2½–5 ft.: stem erect, branching: lvs. sessile, ovate-lanceolate, acutely serrate: calyx lobes very broad, acute, serrulate, one-half shorter than the broadly bell-shaped corolla: fls. in a loose or dense panicle, which may be 3½ in. long and thick; corolla white or pale blue, 1 in. long, nearly 1½ in. broad: capsule ovoid, erect. Caucasus, Siberia. B.M. 1973.—Not advertised in Amer. at present. *C. celtidifòlia*, Boiss., referred to the above, may be a strongly marked variety. A plant once cult. at Harvard Botanic Gardens has very characteristic, perfectly elliptical lvs., blue fls., and more open inflorescence.

334. Campanula persicifolia.
(There are forms with more broadly bell-shaped flowers.)

12. **thyrsoìdes,** Linn. Biennial: height 1–1½ ft.: stem grooved: lvs. all covered with long hairs at the margin; root-lvs. sessile, spatulate or obtusely lanceolate, 2½ in. long, ¾ in. wide, in a dense rosette, lying on the ground; upper lvs. more narrow and acute: fls. 40–50, sulfur or creamy yellow, in a dense thyrse-like spike, which may be 6 in. long and 2½ in. broad: style exserted. B.M. 1290. L.B.C. 17:1644.—Intermingled with the fls. in the spike are lvs. which are longer than the fls., which is not true of *C. lactiflora*. Should not be confounded with *C. thyrsoidea*, Lapeyr., which = *C. speciosa*. No blue or purple forms are known. The picture in B.M. shows a characteristic red-tipped calyx.

FF. *Corolla large, long-tubed.*

13. **Vidálli,** H. C. Wats. Perennial: height 1–2 ft.: stem branching from the base: some branches short, sterile, others tall, floriferous, all grooved, clammy, glossy: lvs. 3–4 in. long, oblong-spatulate, coarsely serrate, thick, fleshy, firm, viscid, the upper ones gradually becoming bracts: fls. 2 in. long, nodding, about 9 in a loose terminal raceme; calyx lobes triangular, thick, one-fourth shorter than the corolla; corolla tubular, swelled below, constricted above, with a yellow base. Azores. B.M. 4748. F.S. 7:729. A.Fl. 3:116. Gn. 54, p. 299. G.C. III. 18:95.—Very distinct.

EE. *Color of fls. normally blue or purple, with white varieties.*

F. *Size of fls. large.*

G. *Raceme pyramidal, usually dense.*

14. **pyramidàlis,** Linn. CHIMNEY CAMPANULA. Figs. 335, 336. Glabrous: lvs. glandular-dentate, lower petiolate, ovate-oblong, subcordate; stem-lvs. sessile, ovate-lanceolate: calyx lobes acuminate, spreading, half as long as the broadly bell-shaped corolla: fls. numerous, in pyramidal racemes. Austria, near Adriatic. Gn. 45, p. 67; 48, p. 306; 51, p. 221 (a staked pot plant). R.H. 1897, p. 238. Gn. 53, p. 535 (with extensive cultural notes).

Var. **compácta,** Hort. S.M. 2:97. Gn. 47, p. 86 (with very full cultural notes). The tallest of Campanulas and one of the oldest. Much grown in pots for exhibition. The compact variety is very floriferous and convenient for conservatory, but lacks the characteristic tall, pyramidal habit.

GG. *Raceme not pyramidal, usually looser.*

15. **latifòlia,** Linn. Height 3–4 ft.: lvs. large, doubly serrate; root-lvs. sometimes 6 in. long, petiolate, cordate, covered with soft hairs; stem-lvs. sessile, more acuminate: peduncle 1-fld.: calyx lobes long-acuminate, one-third shorter than the corolla: fls. 6–15 in a loose spike or raceme about 8 in. long, erect, very large, 2½ in. long, purple or dark blue, hairy. Eu., Persia. Var. **macrántha,** Sims (*C. macrántha*, Fischer), is commoner in cult. than the type, a little hairier, with a glabrous calyx and very large fls. B.M. 2553 and 3347. R.H. 1897, p. 239. Var. **eriocárpa,** DC., has the stem and lvs. pilose and more pallid, and a hispid calyx tube. There is a white-fld. form. It is native to England, and is easily naturalized in their wild gardens. The stem-lvs. are probably the largest of any of the garden kinds, often 3½ in. long and 2 in. wide.

FF. *Size of fls. small, less than 1 in. long.*

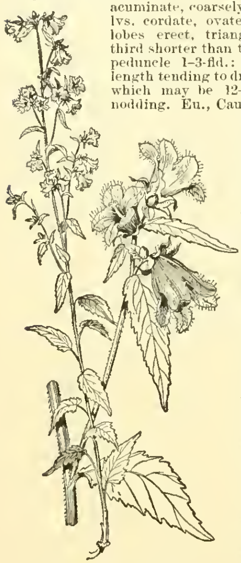
16. **Bononiénsis,** Linn. Height 2–2½ ft.: scabrous: stem simple: lvs. serrulate, ovate-acuminate, pallid beneath; root-lvs. cordate-petiolate; upper lvs. clasping: calyx lobes acuminate, one-fourth shorter than the funnel-shaped corolla: fls. normally purplish, in a long, loose, pyramidal spike, which may be 2 ft. long, with 60–100 small fls.; corolla ¾ in. long and broad. E. Eu., W. Siberia, and Caucasus. Var. **Ruthénica** (*C. Ruthénica*, Bieb.) has lvs. wider and tomentose beneath. Caucasus and Tauria. B. M. 2653. There is a white-fld. form. The fls. are much smaller than in *C. latifolia*, and the raceme is much larger.

335. Pot plant of Campanula pyramidalis.

336. Nearer view of flowers—Campanula pyramidalis.

17. **rhomboìdalis,** Linn. Height 1 ft., sometimes 2: stem simple, erect: lvs. sessile, ovate-acute, serrate: calyx lobes awl-shaped, one-half shorter than the bell-shaped corolla: fls. 8–10 in an almost corymbose raceme, the lower pedicels of which may be 3 in. long, the

uppermost 1 in. or less: corolla purplish blue, with a white variety, 1 in. long and a little wider. Mts. of Eu. B.M. 551, as *C. azùrea.*—It flowers in July and August, after which the stems and lvs. die down quickly.



337. Campanula Trachelium

18. **Trachèlium,** Linn. Fig. 337. Height 2–3 ft.: stem angular, covered with dense, short hairs: lvs. rough, acuminate, coarsely crenate-dentate; root-lvs. cordate, ovate, short-stalked: calyx lobes erect, triangular-acuminate, one-third shorter than the bell-shaped corolla: peduncle 1–3-fld.: fls. erect at first, at length tending to droop, in a loose raceme, which may be 12–18 in. long: capsule nodding. Eu., Caucasus, Siberia, Japan. R.H. 1897, p. 239. There is a double-fld. form.—One of the commonest and hardiest of the border perennials, often running out the other Campanulas, and hence passing under many names, especially *C. urticifolia.*

19. **rapunculoìdes,** Linn. Height 2–4 ft.: stem a little rougher than in *C. Trachelium:* lvs. rough, ovate-acuminate; root-lvs. petiolate, cordate, crenulate; stem-lvs. serrulate: calyx a little rougher than in *C. Trachelium:* lobes linear-lanceolate, at length reflexed, one-fourth shorter than the funnel-formed corolla: fls. solitary, nodding, in long, racemose spikes. Eu., Caucasus, Siberia.

20. **versícolor,** Sibth. & Sm. Height 3–4 ft.: plant glabrous: stem ascending: lvs. serrate; root-lvs. long-petioled, ovate-acute, subcordate; stem-lvs. short-petioled, ovate-lanceolate, acuminate: calyx-teeth acuminate, spreading, at length reflexed, one-half as long as the corolla: fls. in long, spicate racemes; style exserted: capsule spheroid. Greece.—Rare.

DDD. *Inflorescence an open, compound panicle.*

21. **divaricàta,** Michx. Glabrous: height 1–3 ft.: stem erect, slender, paniculate above: branches slender, divergent: lvs. sparse, subsessile, ovate-lanceolate, acuminate at both ends, coarsely serrate: calyx-lobes awl-shaped, one-half shorter than the tubular, bell-shaped corolla: fls. small, nodding, blue, in a very open and compound panicle; style straight exserted. Alleghanies, from Va. to Ga.—Rare in gardens.

AA. *Low-growing or rock-garden Campanulas, mostly less than a foot high*

B. *Calyx with an appendage at the base of each sinus, often minute or disguised in form.*

C. *Throat of corolla spotted violet.*

22. **punctàta,** Lam. (*C. nóbilis,* Lindl.). Named from the spotted corolla, the purplish spots being inside and showing through faintly in the fresh fl. but more plainly in the dried specimen. Height 1 ft.: stem with longer and looser hairs than in *C. alliariæfolia:* upper lvs. nearly sessile, and more sharply toothed than the lower: calyx-lobes one-third as long as the corolla, longer, looser and hairier than in *C. alliariæfolia,* and the margins much more recurved: peduncle 1–4-fld.: fls. nodding; corolla cylindrical, 2¼ in. long, white, spotted within, strongly ribbed. Siberia, Japan. *C. nobilis* has been considered distinct. In F. S. 3:247 the corolla is dark violet without, the limb hairy, while in B. M. 1723 (*C. punctata*) the corolla is white outside and not bearded. In F.S. 6:563 (*C. nobilis,* var. *alba*) the limb is not bearded and the stem is red, and not hairy. The three pictures show great differences in foliage, pubescence and appendages. This is one of the most interesting of all Campanulas, and is, unfortunately, usually considered more quaint than beautiful. Cannot be used for cutting. The spotted throat readily separates it from all Campanulas. See supplementary list for *C. Van Houttei,* a supposed hybrid.

CC. *Throat of corolla not spotted.*

D. *Stems 1-flowered.*

23. **Alliònii,** Villars. Height 3–5 in.: rootstock slender, creeping underground, sending up stems at intervals of ½–1 in.: lvs. few, about 7 on a stem, 1–2 in. long, linear-lanceolate, sessile, slightly hairy, entire, midrib distinct, lower ones in a whorl of about 5, upper ones similar but more erect: calyx-lobes lanceolate, half as long as the corolla, the appendages ovate, reflexed, one-third the length of the calyx-lobes: fls. purple, with a rare white variety, only one on a stem, inclined or nodding, 1½ in. long, and as broad across the mouth, the largest for the size of the plant of any Campanula. A very local species, found only in the Alps of Piedmont and Savoy. B. M. 6588.—No white-fld. form is known. Int. into Eng. about 1879 by G. Maw. "It is an excellent rock-plant, and, though requiring plenty of moisture, it should have a well-drained position, and is therefore best grown in a narrow crevice filled with sandy loam and an abundance of small stones and grit."—*F. W. Meyer.*

DD. *Stems several-flowered.*

E. *Margin of corolla bearded.*

24. **barbàta,** Linn. Height 6–9 in.: stem pilose: lvs. villous, entire or nearly so; root-lvs. tufted, lanceolate; stem-lvs. few, ligulate?: raceme loose, 3–4-fld.: fls. nodding, pale blue; calyx appendage ovate, obtuse, half as long as the lobes; corolla bell-shaped, shorter than in *C. Allionii,* and with a bearded mouth. Alps. L.B.C. 8:788. Gn. 48, p. 297.—There is a white-fld. form, but apparently no purple. Readily told from *C. Allionii* by the different colored, bearded and smaller fls., which are rarely borne singly, and by the dense, soft hairs of the stem. Commonest species in the Alps. "In the rock-garden it should be grown in poor, stony soil, as it is apt to become somewhat coarse when grown in rich soil."—*F. W. Meyer.*

EE. *Margin of corolla not bearded.*

F. *Fls. erect.*

25. **móllis,** Linn. Perennial: velvety gray: height 6–8 in.: stems procumbent, about 2-fld.: root-lvs. tufted, obovate or spatulate; stem-lvs. ovate or rotund: fls. loosely panicled; calyx-lobes lanceolate, erect, half shorter than the glabrous, bell-shaped corolla; appendages minute, shorter than the calyx tube; corolla erect, dark purplish blue or lavender, with a white throat, the tube long, segments short, broad, spreading, acute. Spain, Crete. B.M. 404.—Rock or border plant; not adv. in America.

FF. *Fls. nodding.*

26. **alpìna,** Jacq. Height 3–8 in.: stem furrowed: lvs. smaller than in *C. barbata,* more narrowly lanceolate, entire, hairy: fls. typically deep blue, bell-shaped, with broader and shorter segments than in *C. barbata:* calyx-lobes proportionately very long, surpassing the fl.-bud, and nearly as long as the flower, but widely spreading. Swiss and Austrian Alps. B.M. 957. J.H. III. 29:5.—There is a white-fld. var. Int. into England about 1805 by Loddiges. The plant has a characteristic shaggy appearance from the hairy lvs. Easy of cult.

27. **Sibírica,** Linn. (*C. Hòhenackeri,* Fisch.). Setaceous-pilose: stem erect, simple, panicled above: lvs. crenulate; root-lvs. petioled, obovate, obtuse; stem-lvs. lanceolate-acuminate: calyx hairy, the lobes long-acuminate, a third shorter than the corolla: calyx appendages like the lobes but half shorter and reflexed: fls. 25 or more, violet, with a longer and narrower tube than in C. *alpina,* and longer divisions of the limb. N. Asia, Caucasus, W. Eu. B.M. 659. R.H. 1861:431.—The type is rare, but var. **eximia,** Hort., is somewhat

commoner. It is dwarfer, much branched, with long, scabrous lvs. and pale bluish to violet fls. See Mottet's translation of Nicholson, Dict. Gard. Var. **divérgens,** Willd., has larger fls. and broader lvs. than the type. G.C. III. 16: 597. *C. Sibirica* usually does best when treated as a biennial.

BB. *Calyx without appendages.*

C. *Fls. very wide-spreading, i.e., rotate, wheel-shaped, almost flat.*

D. *Blossoms all erect.*

28. **Waldsteiniàna,** Roem. & Schult. Perennial: height 4–6 in.: stems rigid, glabrous: lvs. fleshy, sessile, gray-green, lanceolate, slightly serrate-dentate, the lower obtuse, the upper long-acuminate: calyx lobes awl-shaped, spreading or recurved, one-fourth shorter than the corolla: fls. 5–9 in a corymbose raceme 1¼ in. long, ¾ in. wide, pale purplish blue; corolla rotate, almost starlike, with a dark spot in the throat: pistil large, white, twice the length of the corolla, with a yellow stigma. Hungary. Gn. 8, p. 173.—Not advertised in America at present.

DD. *Blossoms not all erect.*

E. *Habit trailing or pendulous.*

29. **frágilis,** Cyrill. Perennial: height 4–6 in.: stems diffuse, trailing: root-lvs. long-petioled, roundish-cordate, obtusely dentate, or crenately lobed; stem-lvs. smaller, scattered, the uppermost ovate-lanceolate: fls. pale purplish blue with a white center, 1½ in. wide, in loose corymbs; calyx lobes linear-lanceolate, acuminate, erect, almost equaling the corolla; style exserted: capsule ovoid. Italy. B.M. 6504. P.M. 11:25. Gn. 8, p. 174, and 47, p. 278. Var. **hirsùta,** DC., is a hairier form.—This is the best species for hanging baskets, window and veranda boxes, and for covering large stones in the rockery. Prop. by cuttings in spring, the roots being too fragile to divide well. Not so hardy as *C. Garganica.*

30. **Gargánica,** Tenore. Height 3–6 in.: stem diffuse: lower lvs. reniform-cordate, crenate-dentate; upper lvs. ovate-acute, dentate: raceme lax: peduncles 1–2-fld.: calyx tube spheroid, the lobes spreading, a third or fourth shorter than the glabrous corolla. Mt. Gargano in Italy. B.R. 21:1768. Gn. 48, p. 295, and 43, p. 25. Var. **hirsùta,** Hort., is a hairier form. Gn. 46, p. 253, and 48, p. 297.—"Owing to the pendent character of its flowering branches, its proper place is against a rocky ledge, over which its masses of flowers may hang."—*J. C. Niven.* Half-shaded position. Prop. by cuttings or by division.

EE. *Habit not trailing or pendulous.*

31. **Elatines,** Linn. Perennial, more or less pubescent: height 5–6 in.: lvs. cordate, coarsely and acutely dentate, lower rotund, others ovate-acute: raceme lax: calyx tube spherical, the lobes spreading, linear-lanceolate, somewhat unequal, a half shorter than the rotate corolla: style exserted. Piedmont.—Rare rock plant for light, stony soil.

32. **Portenschlagiàna,** Roem. & Schult. (*C. muràlis,* Port.). Height 6–8 in.: stems somewhat erect: lvs. all alike petiolate, cordate, roundish, acutely angular-dentate: calyx tube spheroid, lobes erect, acuminate, a third shorter than the infundibuliform corolla: fls. racemose. Dalmatia.—Allied to *C. Garganica,* but the corolla not so deeply 5-cut. Little known. For conflicting descriptions, see Gn. 8, p. 173, and 48, p. 297.

CC. *Fls. broadly bell-shaped, less widely spreading than in C., wider than in CCC.*

D. *Height 2–3 in.*

33. **Ràinerii,** Perpenti. Height 2–3 in.: stems suberect, branching; branches 1–3-fld.: lvs. subsessile, ovate, distantly serrate, the lower smaller and obovate: calyx tube obconical, the lobes long-acuminate, erect, half shorter than the broadly infundibuliform corolla: fls. large, solitary, erect, dark purplish blue: style short, not exserted: capsule obovate. Mts. near Lake Como. F.S. 18:1908.—One of the choicest rock plants, but somewhat rare. Several forms of the hybrid Campanula G. F. Wilson are often cult. under this name, but their lvs. are lighter green and less tomentose than *C. Rainerii.* Enjoys a well drained, sunny position.

DD. *Height more than 2–3 in.*

34. **Tenòrii,** Moretti. Height 8–12 in., glabrous: stem ascending or prostrate: lvs. leathery; root-lvs. long-petioled, ovate, subcordate, irregularly serrate; stem-lvs. petiolate, ovate-acute, coarsely serrate: calyx lobes linear-lanceolate, spreading, half as long as the broadly bell-shaped corolla: fls. racemose: capsule spherical. Naples.—This is now referred to the Grecian species *C. versicolor,* which is typically taller. In the garden, *C. Tenorii* resembles *C. pyramidalis* in foliage and flower, but is shorter.

E. *Style not exserted.*

35. **Carpática,** Jacq. Fig. 338. Height 9–18 in., glabrous: stem branching: lower lvs. thin, long-petioled, ovate-rotund, cordate, coarsely dentate, undulate; upper ones shorter petioled, ovate-acuminate: peduncles long, terminal and axillary, 1-fld.: fls. large, often 1½ in. wide, deep blue or white: calyx tube obconical, the lobes acute, wide at the base, subdentate, erect, a third or half as long as the broadly bell-shaped corolla: style not exserted: capsule ovoid-cylindrical. Carpathian Mts. of Austria. B.M. 117. Gn. 48, p. 297. Var. **turbinàta,** Hort. (*C. turbinàta,* Schott), is dwarfer, more compact, with fls. more bell- or top-shaped, and often 2 in. across, purplish blue. It also has larger lvs. and more decumbent habit. Gn. 45, p. 171. A form with pallid fls. is rarer. Var. **G. F. Wilson,** Hort., is a hybrid of var. *turbinata* and *C. pulla,* with the large fls. of the former and the handsome dark foliage of the latter. It is compact, dwarf, and small, ovate, very hairy lvs., with crenate-serrate margin. *C. Haylodgénsis,* Hort., is a garden hybrid, probably between *C. Carpatica* and *C. cæspitosa.* Raised by Anderson Henry, Hay Lodge, Edinburgh. Height 6–9 in.: root-lvs. tufted, roundish cordate, slightly dentate: stem-lvs. light green, ovate-cordate, conspicuously toothed: fls. light blue, bell-shaped, few, at the ends of stems. Var. **pelvifórmis,** Hort., from Crete, has very large, pale lilac, almost saucer-shaped fls. R.H. 1882, p. 509. Var. **Héndersoni,** Hort., is generally referred to var. *turbinata,* but is more robust. Lvs. ovate and ovate-cordate, 1½ in. long, ¾ in. broad, slightly hairy on both sides, folded upwards, serrate; petioles 1–1½ in. long: fls. dark blue, 1½–2 in. wide, in short, 6–9-fld. racemes.—This species is among the first dozen in popularity, and is very variable in height and in shape of flowers.

338. Campanula Carpatica.

EE. *Style exserted.*

36. **isophýlla,** Moretti (*C. floribúnda,* Viv.). Stem suberect: lvs. all alike, petiolate, roundish cordate, crenate-dentate: calyx lobes acuminate, half shorter than the broadly bell-shaped corolla: fls. pale blue, 1 in. or more wide, corymbose; style exserted: capsule ovoid. Italy. B.M. 5745. Gn. 49, p. 483; 48, p. 297.—An excellent basket or rock plant in sun or half shade. The white variety seems to be more popular. Fls. may be saucer-shaped.

CCC. *Fls. bell-shaped.*

D. *Style exserted.*

37. **Scoùleri,** Hook. Height 8–12 in.: stem simple or branched: lvs. acutely serrate, somewhat hirsute; lower ones ovate-acute, petioled; middle ones ovate-lanceo-

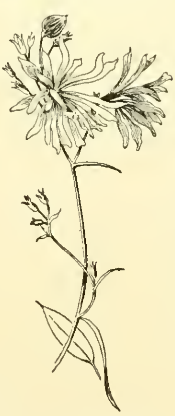
late; upper linear-lanceolate, sessile: calyx lobes awl-shaped, erect, one-third shorter than the corolla: fls. racemose, or more or less panicled: style exserted: capsule ovoid. Columbia river.—The capsular valves are a little above the middle, while in *C. Carpatica* and *C. persicifolia* they are near the apex. A rare western American species.

DD. *Style not exserted.*

E. *Color very dark purple.*

38. **púlla,** Linn. Height 3–5 in.: stem normally 1-fld.: lvs. glabrous, crenulate-dentate; lower ones short-petioled, ovate-rotund: upper sessile, ovate-acute: calyx lobes long-acuminate, erect, a half shorter than the bell-shaped, nodding corolla. Mts. of Austria. In B.M. 2492 the calyx lobes are short-acuminate, a sixth as long as the corolla. L.B.C. 6:554.—Darkest flowered of all Campanulas.

339. "Blue Bells of Scotland"—Campanula rotundifolia.
Natural size.



340. Campanula rotundifolia. var. soldanellaeflora.

EE. *Color not very dark purple.*

39. **rotundifòlia,** Linn. Hairbell. Harebell. Blue Bells of Scotland. Fig. 339. Height 6–12 in. Root-lvs. petiolate, cordate, crenate-dentate: stem-lvs. linear or lanceolate, usually entire: calyx lobes awl-shaped, erect, a third shorter than the bell-shaped corolla: fl. buds erect. Eu., Siberia, W. N. Amer. Gn. 53:1153.—This is one of the most cosmopolitan of all Campanulas, and the true hairbell or bluebell of literature. In the wild it is slenderer and taller than in the garden. In shady woods it often grows 2 ft. high. The type has a white-fld. variety which is much less popular, but G.C. 1861:698 shows an excellent pot-plant of it. Var. **Hòstii,** Hort. (*C. Hòstii,* Baumg.), has larger fls. than the type and stouter stems. The lower stem-lvs. are lanceolate, remotely dentate, the upper linear entire: calyx lobes longer than in the type, a half shorter than the corolla. The white-fld. form is not as vigorous. The most pronounced form is var. **soldanellæflòra,** Hort. (*C. soldanélla,* Hort.). Fig. 340. With semi-double blue fls. split to the base into about 25 divisions. F.S. 18:1880.—This curious variation is unique in the genus. The alpine soldanellas are famous among travellers for melting their way through the ice. They have fringed blue fls. The name of this species seems singularly inappropriate until we have sought the root-lvs. in early spring.

40. **Scheúchzeri,** Vill. (*C. lìnifolia,* var. *Scheúchzeri*) Height 4–12 in.: stem 1–4-fld., usually 1-fld.: root-lvs roundish, ovate, or cordate: stem-lvs. linear or narrowly lanceolate, sessile, denticulate, the lowest stem lvs. spatulate: calyx lobes slender, linear-awl-shaped, nearly as long as the bell-shaped corolla. Alpine and subarctic regions of Newfoundland, Labrador, Alaska. F.S. 21:2205, not L.B.C. 5:485, which DeCandolle states most emphatically is *C. rotundifolia* and nothing else. The stem-lvs. of *C. Scheuchzeri* are distinctly serrate, while in *C. rotundifolia* they are entire; the flower-buds nod in the former, but are erect in the latter. The calyx lobes are relatively longer in *C. Scheuchzeri,* and perhaps the bell is deeper.

41. **cæspitòsa,** Scop. (*C. pùmila,* Curt. *C. pusílla,* Hænk.). Height 4–6 in.: root-lvs. tufted, short-petioled, ovate, glandular-dentate, shining: calyx lobes linear, erect, a third shorter than the bell-shaped corolla: fls. nodding, pale blue or white; pollen violet-colored. B.M. 512. Gn. 43:892. Gn. 48, p. 297.—Dwarfer than *C. rotundifolia,* with root-lvs. never reniform, shorter-petioled, and lasting until after fls. have gone. Perennial, quickly forms a dense mat. Border, edgings, or rockery. The European trade catalogues usually offer *C. cæspitosa* and *C. pusilla* separately, and doubtless plants of distinct horticultural value are passing under these names, but there seem to be no botanical or horticultural descriptions that will distinguish them.

42. **excìsa,** Schleich. Perennial, glabrous: height 4–5 in.: stems slender, 1-fld.: root-lvs. spatulate: upper lvs. linear: calyx lobes bristly, spreading, at length reflexed, a third shorter than the bell-shaped corolla: fls. pale blue, divided to about half their depth, with a round hole at the base of each sinus, which easily distinguishes it from *C. pulla* and all other Campanulas. Rare in Alps. B.M. 7358. L.B.C. 6:561.—A rare rock plant. Likes cool, moist air, and not too full exposure to sun. Not advertised in America.

CCCC. *Fls. long-tubular, abnormal.*

43. **Zòysii,** Wolf. Height 3–4 in.: plant tufted, glabrous: stems few-fld.: root-lvs. entire, crowded, petiolate, ovate-obovate, obtuse: stem-lvs. obovate-lanceolate and linear: peduncles 1-fld, terminal, rarely axillary: calyx lobes linear, awl-shaped, spreading, a fourth shorter than the corolla: corolla long-cylindrical, constricted at the apex, wider at the base, sharply angled. Austrian Alps. Gn. 8, p. 173. G.C. III. 20:183.—A rare and abnormal species. "Fls. large in proportion to the size of the plant, azure blue, * * * terminated before expansion by a pretty stellate process, arising from the infolding of the segments of the corolla after expansion. These are seen to be densely bearded, forming a mass of hairs surrounding the large capitate stigma."—*J. C. Niven.*

AAA. *Kitchen garden vegetable: roots radish-like. A salad plant.*

44. **Rapúnculus,** Linn. Rampion. Biennial: height 2–3 ft.: root spindle- or long-radish-shaped, ½ in. thick, white: stem erect, sulcate: lower lvs. obovate, short-petioled, somewhat crenate: stem-lvs. linear-lanceolate, entire: fls. lilac, in a spike or raceme: calyx tube obconical, lobes glabrous or bristly, erect, awl-shaped, a half shorter than or nearly equal to the funnel-shaped corolla. Eu., Orient, N. Asia, N. Afr.—The roots and lvs. are eaten as a salad. The seeds, which are the smallest of any kitchen garden vegetable, are sown in the open ground in early May either broadcast or in drills. A little sand mixed with the seed gives an evener sowing. Press firmly, and water carefully. Thin out the seedlings if necessary. Water freely in hot weather. A fresh sowing may be made in June, as early sown plants may run to seed. Roots are gathered in October, and may be stored in sand for winter use. Rapunculus means a little turnip. Vilmorin-Andrieux, The Vegetable Garden.

C. abietìna, Griseb. Rare, tufted, rockery plant, with slender, wiry stems 9–15 in. high: fls. light blue in loose, branching spikes. July–Aug. E. Eu.—*C. calycánthema,* Hort.= C. Medium, var. calycanthema.—*C. Cenísia,* Linn. A rare rock plant from Mt. Cenis and other mts. of the Alps, is a rare tufted rock plant with solitary deep blue fls. on stems 2 in. high. Root-lvs. obovate, obtuse; stem-lvs. ovate-oblong; all lvs. sessile-entire: calyx hirsute, the lobes linear-lanceolate, a half shorter than the deeply 5-cut, spreading corolla.—*C. Dahùrica,* Hort. Plants sold under this name are likely to be C. glomerata, var. speciosa.—*C. Erìnus*, Linn. Annual: plant hispid: height 3–9 in.: lvs. small, glossy, ¼–¾ in. broad, cordate, deeply cut, the pointed lobes conspicuous: fls. sessile, pale blue with a light center, tubular (or star-shaped?), ½ in. broad, with acute narrow lobes; style long, conspicuous, colored like corolla: racemes long, semi-prostrate, 10–20-fld. Mediterranean. Rare short-lived rock plant. Also for edgings and pots.—*C. grandiflòra*, Jacq.=Platycodon grandiflorus.—*C. Lamárckii*, D. Dietr.=Adenophora Lamarckii.—*C. nítida*, Ait.=C. planiflora.—*C. planiflòra*, Lam. (C. nitida, Ait.). Glabrous: height 3–9 in.: stem simple: lvs. sessile, leathery, shining: root-lvs. crowded in a dense rosette, ovate or obovate-obtuse, crenulate, 1½ in. long; stem lvs. linear-lanceolate, acute, nearly entire: fls. blue or white, with double varieties, in spicate racemes; calyx lobes ovate, acute, broad, erect, a third shorter than the broadly bell-shaped or saucer-shaped corolla. Not American, though commonly so stated. Habitat unknown. J.H. III. 33: 283. Rock plant, for sunny position.—*C. speciòsa*, Pourr., is a rare species. Most of the plants passing under this name are likely to be C. glomerata. B.M. 2649 is C. glomerata, var. speciosa.—*C. Speculum*, Linn.=Specularia Speculum.—*C. urticifòlia*. This name is now abandoned. Plants are likely to be C. Trachelium.—*C. Van Hoúttei*, Carr. Height 2 ft.: root-lvs. long-petioled, roundish cordate, more or less lobed; stem-lvs. sessile, oval-lanceolate, irregularly bi-dentate, 2½–4 in. long, more or less villous, strongly nerved: fls. usually solitary, nodding at the end of a small branchlet, 2 in. long, half as broad, indigo blue, or violet; calyx lobes linear, spreading, 1 in. long. A garden hybrid resembling C. punctata. Int. into France 1878 by Thibaut and Keteleer. R.H. 1878, p. 420 (descr.). Var. pallida has pale lavender fls.

W. M.

CAMPHÒRA (from camphor, made from its juice). *Lauràceæ*. The Camphor Tree (*Camphòra officinàlis*, Steud.) is native to China and Japan, but it is now introduced into S. Fla. Botanically, it is very closely allied to the cinnamons, and is often referred to that genus (as *Cinnamomum Camphora*), but it differs in its scaly buds, membranaceous calyx, and leaf characters. *Camphora officinalis* attains a height of 40 ft., and endures light frosts. It has alternate, ovate-elliptic, entire, thick lvs., and axillary panicles of small, yellow fls. The whole plant contains camphor. The gum is obtained from the extracted juice.

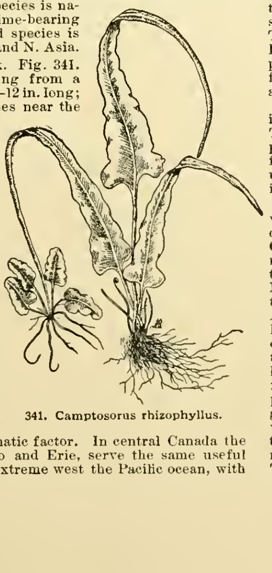
CAMPION. See *Silene*.

CAMPSIDIUM. See *Tecoma*.

CAMPTOSÒRUS (Greek, *bent sori*, alluding to the irregular arrangement). *Polypodiàceæ*. A small genus of hardy ferns, with simple, pointed lvs., which take root at the apex, and are hence known as "Walking-leaf Ferns." A single species is native mostly on lime-bearing rocks, and an allied species is known from Japan and N. Asia.

rhizophýllus, Link. Fig. 341. Lvs. simple, tapering from a heart-shaped base, 4–12 in. long; veins forming meshes near the midrib; sori irregularly scattered. Canada to Alabama.—Sometimes grown in rockeries and wild gardens.

L. M. UNDERWOOD.



341. Camptosorus rhizophyllus.

CAMPYLOBÒTRYS. See *Hoffmannia*.

CANADA. Figs. 342–4. The most important fruit regions of Canada are those surrounded wholly or in part by bodies of salt or fresh water. In the extreme east the Atlantic ocean with its indentations, is the influencing climatic factor. In central Canada the great lakes, Ontario and Erie, serve the same useful office, while in the extreme west the Pacific ocean, with its gulf stream, tempers the climate of British Columbia, and gives sufficient atmospheric moisture, so that all but tropical and citrus fruits may be grown in the most favored localities. It is interesting to note that while on the eastern Atlantic coast apples are successfully grown as far north as the 47th parallel north latitude, and in British Columbia as far north as the 52d degree north latitude, yet in the interior of Ontario and Quebec they have not succeeded north of the 46th parallel.

The fruits of Canada of to-day are attributable to 5 main sources: 1. Seeds, brought by the first French missionaries and English colonists. 2. Seeds and plants obtained from Virginia and New England. 3. Plants and seeds brought in by United Empire Royalists. 4. Chance seedling production. 5. Recent importation from Europe, and systematic plant-breeding.

In order to obtain an idea of the character of fruits cultivated in the Dominion, it will be necessary to consider the provinces separately:

PRINCE EDWARD ISLAND.—Latitude, 46 degrees to 47 degrees north, area about one and a quarter million acres. The surface is undulating, the whole island eminently agricultural and pastoral. Soil, a reddish loam, sometimes sandy and occasionally clayish. The climate is sufficiently mild to admit of the cultivation of pears and of plums of the *Prunus domestica* type. The winters are long and tedious, with heavy snowfalls, and frequent fogs and sleety rains. The first fruits introduced were apples, by French colonists. Later, the English and Scotch settlers brought other apples and pears, in addition to Kentish cherries. It is probable, also, that some of these early fruits were introduced by the Acadian French. We still find on the island a few of the old French orchards of apples and cherries. Cherries have been cultivated—in fact, they have taken care of themselves—with success since the time of their first introduction. They belong to the Kentish type, and ripen in that locality a month later than do the same varieties grown in eastern Ontario. Black-knot has lately appeared, but is being attended to. Apple-growing is on the increase. The better practices in fruit-growing are being introduced; a few large orchards are already established and are bearing satisfactorily. The climate has an important effect upon the keeping properties of apples and pears. Such late-maturing varieties as Ben Davis, Stark, and Missouri Pippin do not, as a rule, attain full size and perfection. The autumn and early winter apples of the west are the most suitable varieties. Of these are Ribston, Blenheim Pippin, Hubbardston and Grimes Golden. The same is true of pears. The early and midseason varieties do best. Clapp, Bartlett, Howell, and Anjou are doing well. Among plums, Moore's Arctic, Early Damson and Lombard are favorites. Peaches cannot be grown successfully unless artificially protected during winter.

Small-fruits are grown successfully in all parts of the island. The most important of these is the cranberry. The area devoted to this fruit is extending rapidly. The product is shipped to England. There is undoubtedly a future for fruit-growing on this island, with its natural under-drainage in many parts, its equable climate, and its proximity to the European market.

NOVA SCOTIA AND CAPE BRETON.—The Dominion owes very much to this province for the good pioneer work done in advertising the fruit-growing capabilities of Canada in the European markets. The best advertisement that could be given by any country was afforded by the magnificent display of fruit made by the Province of Nova Scotia through its Fruit Growers' Association at the Indian and Intercolonial exhibition in London in 1886. As early as the middle of the last century, the Acadian French, who then peopled Kings and Annapolis counties, cultivated apples and pears with great success. When these lands fell into the hands of Connecticut and English immigrants in 1760, old pear and apple trees were found in many places; some of the latter exist at the present day. It must not be supposed that the apple growing of Nova Scotia is restricted to the Annapolis valley. This valley is only one of several, and the contiguous fertile valleys of the Cornwallis and Gaspereaux rivers are equally well adapted and equally productive. The protection afforded in this, the best fruit section of the province, by the low parallel lines of hills, known as the north and south mountain ranges, is important and valuable as windbreaks. The numerous bays and inlets assist in equalizing temperatures, and exercise a marked influence upon the longevity of the apple tree in this region. The soil consists of sand, sandy loam and clay, overlaying sandstone formation. The enormous rise and fall of the tides have produced extensive deposits constituting the present marsh and dyked lands. These marsh lands serve the purpose of supplying an abundant annual supply of herbage, in addition to yielding an inexhaustible store of cheap, natural fertilizer, used by fruit-growers with great advantage upon the upland orchard areas. Figs. 342, 343.

Fruit Regions and Fruits.—Kentville, Wolfville, and Berwick are important fruit producing centers. Here are found many of the old English types of apples, such as Golden Pippin and Devonshire Quarrenden. Good apples are grown in nearly all parts of the province, but the valleys already mentioned contain the major portion of the bearing orchards. The total orchard area is estimated at 80,000 acres, and is rapidly increasing. Pears have long been cultivated, but the industry has not grown like the apple. Plums are widely cultivated. Domesticas and Japans do well; Moore's Arctic is the favorite of the former class and Burbank of the latter.

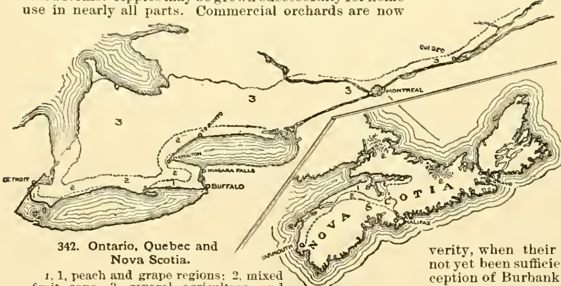
The export of apples to Britain began in 1875, and has been steadily on the increase since that time. The marketable crop of apples in 1896 amounted to 500,000 barrels, nearly all exported to Britain. The characteristic apple of the province is Gravenstein. This, with Ribston Pippin, was imported from England by Hon. Charles Ramage Prescott, between 1830 and 1835. Col. John Burbidge introduced the Nonpareil Russet. Doctor Inglis, the first bishop of Nova Scotia, introduced Yellow Bellefleur to the Annapolis valley, where it is now known by the name of Bishop's Pippin.

The cranberry industry is developing rapidly. In 1890 the output from the cultivated bogs amounted to 400 barrels; in 1898 it had nearly reached 4,000 barrels. The varieties cultivated are selected from the wild marshes.

The fruit-growers of the province are intelligent and energetic. The Provincial Fruit-growers' Association, the oldest in the Dominion, assists in maintaining a horticultural school, which was established at Wolfville and is affiliated with Acadia College.

The fruit-growing industry in Cape Breton is yet in its infancy. The climate and soil resemble that of Prince Edward Island, and practically the same class of fruits are being tested.

New Brunswick.—The climate of this province favors a mixed husbandry. Wild raspberries, strawberries, blueberries and cranberries grow in wild profusion, and have to some extent hindered the growing of cultivated forms. Apples may be grown successfully for home use in nearly all parts. Commercial orchards are now being planted in the valley of the St. John river, at and about Woodstock. Damson and Moore's Arctic plums are grown to a considerable extent. A few growers have found it profitable to protect their plum trees in winter by planting them in such a manner as admits of the trees being reclined on the ground in the autumn. The snowfall is heavy, and is a sufficient protection. Thomas A. Sharpe, of Woodstock, is a pioneer in this work. Of apples, the following varieties have been most successful in the St. John river valley: Duchess, Wealthy, Fameuse, Pewaukee, Longfield, and Scott's Winter. The small-fruit harvest is a week later than in Nova Scotia. New Brunswickers are therefore enabled to place their berries upon the Boston market at a time when competition from other quarters is light in these classes of fruits. Native raspberries and wild cranberries (*Vaccinium Vitis-Idæa*) are gathered and shipped in large quantities to Boston. *V. Vitis-Idæa* is commonly known in New Brunswick as Wolfberry or Lowbush Cranberry. In the past, lumbering, fishing and mining have absorbed much attention in New Brunswick, but fruit culture is constantly receiving increased attention. Bright minds are at work in the province. What to grow, and how to grow it, are questions receiving earnest attention.



342. Ontario, Quebec and Nova Scotia.

1, 1, peach and grape regions; 2, mixed fruit zone; 3 general agriculture, and apples. Nova Scotia: 1, plums, pears, apples; 2, apples.

Quebec.—The climatic conditions in eastern Quebec approach quite closely those obtaining in many parts of New Brunswick. We find the principal fruit areas lying south of that great artery of commerce, the St. Lawrence river. Here and there, not on the low clay flats, but on the higher middle elevations, with gravelly subsoil affording natural drainage, we find orchards made up of "La Belle Fameuse," Pomme Gris, and St. Laurent, truly Canadian and truly delicious apples. In the lower St. Lawrence region, especially on the north side, the keeping season of apples is very much extended—or rather, the ripening season is very much retarded. At Chicoutmi, on the Saguenay, Red Astrachan ripens about the end of September and Wealthy is late winter.

In L'Islet county, about 70 miles northeast of the city of Quebec, plum-growing has become a somewhat specialized industry during its evolution, which covers a period of a century and a quarter. Varieties of Reine Claude and of Orleans plums have originated, and are now peculiar to that district. Reine Claude de Montmorency is a fine flavored strain of the parent group. All plums grow in stocky form, with widely spreading branches, and are very productive. The trees are grown in sod, with little pruning and fertilizing. The marketing season extends from September 15 to October 15. Hardy forms of Kentish cherries have also been developed. The season is a month later than at Ottawa, Ont. Between Quebec and Montreal, along the St. Lawrence river, plums and apples are grown to a limited extent only. The heavy blue clay of the region between the Richelieu and St. Lawrence rivers is unsuited to the cultivation of fruits. A wild fruit which is being grown by the French habitant of the Richelieu and its tributaries is the choke cherry, *Prunus Virginiana*, Linn. The fruit is eaten raw, but is also made into jellies and conserves. A yellow variety is common to gardens in the vicinity of St. Hyacinth, Que. The Island of Montreal is undoubtedly the cradle of the fruit industry of the province. Here a truly intensive style of fruit-growing prevails. Apples, plums and pears are staples. Strawberries, gooseberries, and other small fruits are largely cultivated. Convenient market facilities, both at home and abroad, assist the fruit-grower. The hardier types of *Prunus domestica*, such as Damson and Orleans plums, succeed except in seasons of unusual severity, when their fruit buds fail. Japan plums have not yet been sufficiently tested on the island, with the exception of Burbank, which fruits uncertainly. So far as can be ascertained, the Island of Montreal is the home of the Fameuse and St. Lawrence, and possibly Pomme Gris. About the foothills of those curious outcroppings of the Vermont mountains that we find in the Richelieu valley and in the eastern townships—localities peopled by U. E. Loyalists—fruit-growing is a leading branch of rural labor. Beloeil, Rougemont and Abbotsford are well known to Quebec fruit-growers as leading fruit-growing centers of the province. The standard commercial apples of Ontario and New York, as Greening, Baldwin and Spy, do not succeed. Fameuse, Wealthy and Duchess, with Canada Baldwin and Winter St. Lawrence, do well, the latter two being natives of the Province, and much appreciated. The fruit area along the New York boundary line is rapidly extending. Apples and plums are staples, while pears and grapes are grown for home use. The earlier varieties of grapes only are grown. Concord does not ripen with certainty every year. Delaware, Lady and Moore's Early are generally reliable in this western region.

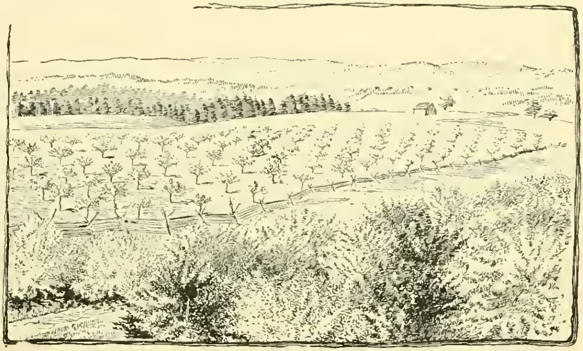
Gibbland Farm, once the home of Charles Gibb (deceased 1890), a prominent amateur fruit-grower and philanthropist, is located at Abbotsford, Que., and contains a large collection of Russian fruits. These fruits were widely distributed in Quebec through the efforts of Mr. Gibb. A few of the summer varieties have superseded older kinds. The only winter Russian apple which has become at all well known in Quebec is Arabka of Ellwanger & Barry. Longfield is also successful in eastern Quebec, where it keeps till midwinter. Unless carefully managed, this variety soon deteriorates by overbearing.

Montreal is the chief apple shipping port during September and October. Later in the year Ontario and Quebec apples go to Europe via Halifax, Portland or Boston. For a number of years past fruit-growers in the vicinity of Montreal have shipped Duchess and Alexander apples to Liverpool and Glasgow. The unsatisfactory feature about the commercial side of fruit-growing in Quebec is the scarcity of good winter export apples. The old standards are not reliable and desirable substitutes have not been found. Canada Baldwin, Scott, Winter and Pewaukee are generally recommended.

Ontario.—From the standpoint of a fruit-grower, the province may be divided as follows:

1. An apple-growing region in the extreme east, on the north side of the St. Lawrence.
2. A pear, plum and apple-growing region between Toronto and Kingston, along the shore of Lake Ontario.
3. An extended and distinctively apple-growing area between Toronto on the south, Owen Sound on the north, Haliburton on the northeast, and Lake Huron on the west. [In the vicinity of Owen Sound, on the south shore of Georgian Bay, plums of *P. domestica* class are extensively cultivated.]
4. A peach, grape, pear, plum and small-fruit region in the Niagara peninsula, between the overlapping ends of Lakes Erie and Ontario. 1, Fig. 342.
5. A peninsula in the west, between Lakes St. Clair and Erie—an area where fruits similar to those noted in the last are cultivated. Pelee Island, in Lake Erie, might be included in this fruit zone. 1, Fig. 342.

Historical.—Along the banks of the Detroit river, in the extreme southwest, are gigantic pear trees. These are from seed planted probably by French missionaries. One of the oldest trees is said to date from 1705. These trees are productive, but the fruit is not valuable. The planting of apple orchards began in this region about the year 1784. The planting of vineyards, for which the region is noted, dates back about 40 years. The Niagara Peninsula was settled somewhat later than the Essex region. Here, between 1780–90, the United Empire Loyalists received grants of land from King George, and planted seeds of apples brought from their homes in the United States. Here we are told that John Smith, in the early part of this century, offered to sell his claim to 200 acres of land for a cow, but found no buyer. This land is now valued at from $300 to $500 per acre. The improvement of native fruits began in 1830 by the introduction of foreign varieties, and by the establishment of home nurseries.



343. Apple orchards in the Annapolis valley, Nova Scotia.

Commercial and statistical.—The peach industry of the Leamington district, in the west (5), is growing rapidly. Though not more than 20 years has elapsed since its inauguration, the present annual output is very large. In 1894, 35,000 baskets of peaches were shipped from Leamington station, Essex county; in 1895 more than double that quantity was sent out. In 1896, more than half a million peach trees were planted in that region. In the Niagara district the output of peaches is much larger, and the fruit industry is more uniformly diversified. The Niagara fruit-grower is strictly up-to-date. Electric cars run every half hour past the doors of the fruit-growers residing between Hamilton and Beamsville; telephones connect their homes, and bring daily market reports. During the shipping season, a fruit train leaving Niagara Falls daily and, running to Hamilion, carries away such peaches, plums, cherries, grapes, pears and berries as are not shipped by boat from St. Catharines, Port Dalhousie, or Niagara on the Lake.

The standard varieties of apples of the province are Spy, Greening and Baldwin. Ben Davis, York Imperial and Ontario are being widely planted—the latter a native of the province. It is a cross between Northern Spy and Wagener, produced by the late Chas. Arnold, of Paris. Princess Louise and McIntosh Red, supposed seedlings of Fameuse, are becoming well known in the eastern parts of the province. Among other fruits produced in the province are the Moyer and Jessica grapes, the Fitzgerald and Longhurst peaches.

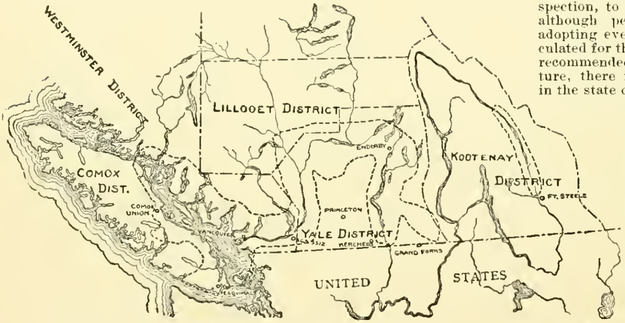
C. C. James, Deputy Minister of Agriculture for Ontario, gives the following estimated statistics regarding fruits and fruit areas in the province in 1895. Area in orchard, garden and vineyard, 320,122 acres; number of apple trees of bearing age, 5,913,900; young trees not bearing, 3,548,053. In 1896, the yield of apples in the province was estimated to amount to 20,000,000 barrels.

The Provincial Fruit-growers' Association has a membership of 5,000, and publishes a monthly Journal of Horticulture. Secretary and editor, Linus Woolverton, Grimsby, Ont.

A series of fourteen fruit experiment stations has recently been established, so located as to cover the various climatic divisions of the province. The object is to test and report upon all fruits, old and new. These are under the joint control of the Ontario Agricultural College and the Ontario Fruit-growers' Association, with L. Woolverton as executive officer, whose duty it is to make an annual report of the whole to the Minister of Agriculture.

Manitoba and the Northwest Territories.—As far as the tree fruits are concerned, those which can be grown successfully in these regions without extraordinary care have yet to be produced. A few Russian apples and Siberian crabs have survived and have produced some fruit in southeastern Manitoba. *Pyrus baccata* (the berried crab of Europe) is hardy at the Dom. Experiment Stations at Brandon, Man., and Indian Head, N. W. Terr. This has been crossed with the hardiest Russian apples in the hope that the resultant seedlings, of which there are now many thousands, will prove hardy in tree, and produce fruit of edible size.

With the protection afforded by belts of timber, small fruits of nearly all kinds—grapes, however, being a notable exception—are grown with a moderate degree of success. The natural obstacles are appreciably less in Manitoba than in the Provinces of Assiniboia, Alberta and Saskatchewan, where late spring frosts, high winds and periods of summer drought and severe winter cold make the cultivation of the hardiest fruits, such as gooseberries and currants, difficult and precarious. Native types of these fruits are cultivated. Juneberries are much appreciated. Without doubt the rancher and wheat grower of these northwest provinces will be dependent for his fruit supply upon Ontario and British Columbia for many years to come. The chief sources of horticultural information in this region are the Dominion experiment stations already referred to.



344. **British Columbia.** The fruit regions are between the parallel series of dotted lines.

British Columbia.—Fig. 344. I am indebted to J. R. Anderson, Deputy Minister of Agriculture for the province, for much of the following data. British Columbia is wonderfully diversified, and has great fruit-growing possibilities in its deltas, its coast line, its valleys, its benches, its irrigated lands. Great climatic variation means a corresponding widening of the possibilities of fruit-culture, and there is here undoubtedly a more extended range of thermometric variation and atmospheric moisture than is found in any other province of the Dominion.

Historical.—Regarding the early history of fruit-growing, and some of its later developments, Mr. Anderson writes as follows:

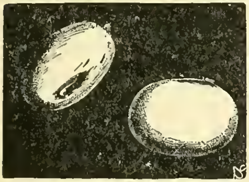
"It was soon discovered by the early settlers in and about the old Hudson's Bay Company's forts of Victoria and Langley, that apple trees would mature and bear fruit. There was, however, a deep-rooted belief that the greater part of the country would not produce fruit, or, indeed, for that matter, crops of any kind. However, gradually trials were made by adventurous spirits, miners, packers, and others (probably never by practical farmers or fruit-growers), and it gradually dawned upon the sparse population that apples and field crops would grow in most parts of the coast line of the province, and of that part known as the dry belt lying between the Coast Range and the Rocky mountains. Then it appeared to occur to the residents that other fruits might do, and thereupon trees and plants were procured from California, and in most cases all were found to be successful. Up to this time (between 1855 and 1860), most of the fruit was the produce of seedlings, the offspring of seeds procured from other countries, which being acclimatized, with a good climate, freedom of insect pests and diseases, produced wonderful crops without the trouble of cultivating, pruning and spraying. Now, however, fruit trees of a superior quality began to be imported, and for some time throve equally well as those of humbler origin, but by and by, for some unaccountable reason, the trees did not bear as well as formerly, nor was the fruit as good or as large as it used to be, and old-timers wondered what was the matter, and so things went on from bad to worse, until people of a new generation began to settle in the province, who soon ascertained the cause of failure to be due to the importation with the trees, from the neighboring states and provinces, of pests and diseases hitherto unknown in the province. It was then that the legislature enacted the Horticultural Board Act, which provides for the appointment of a "Board," whose duties are, *inter alia*, to inspect all fruit and fruit trees entering the province, and orchards within the province, and to make such recommendations in the interest of fruit-growers as they may deem necessary. It has followed, as a matter of course, that in consequence of the stringent regulations, a better class of nursery stock is now imported into the province, and although it is quite impossible, even with the strictest inspection, to detect all infestations, and although people have been slow in adopting even those measures best calculated for their benefit which have been recommended by the Board of Horticulture, there is a marked improvement in the state of the orchards of the province, and of the fruit produced.

The young orchards planted out since the inauguration of the newer and more intelligent methods, are likewise coming into bearing. The production of fruit is even now in many lines in excess of local demands, and hence, in view of the line of action pursued by the Board of Horticulture, which now prevents this province from being the dumping ground for the refuse fruit of the neighboring states, it may reasonably be concluded that the imports of fruits will be restricted in the future to those early fruits which mature in the south, or to the production of the antipodes at a time when those of this country are not in season.

Fruits.—"The principal fruits produced in the province are apples, pears, cherries, plums, prunes, and all the small fruits. Other fruits, such as peaches and grapes, have not been produced in sufficient quantities to meet the demand, those like the first named having been at first considered unsuitable to the country, but are now found to do excellently in many parts."

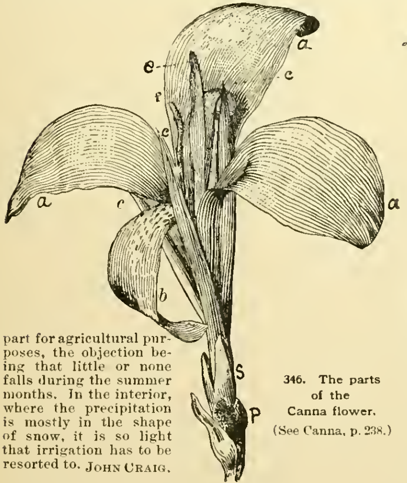
Fruit Sections.—Some of the best fruit lands are to be found along the mountains and foothills on either side of the numerous valleys of the province. This is particularly true of the region along the Fraser river between Chilliwack and Hope. The region along the Fraser river from Agassiz to the coast is one abundantly supplied with water and now producing large quantities of plums, apples and berries. Some of the interior valleys are eminently adapted to the requirements of the tenderest tree fruits. Peaches are being successfully cultivated here and there on the lower bench lands. The accompanying map shows the principal fruit-producing areas of the province. At Vernon, in the Okanagan valley, the Earl of Aberdeen, a late governor-general of Canada, has an extensive orchard of 200 acres. Here an irrigation plant, while not deemed absolutely essential to fruit-growing, is thought to be a desirable adjunct. This valley is producing apples, pears and plums of good quality.

Markets.—"The exportation of fresh fruit to the Northwest Territory and Manitoba, which is the natural market of the province, is assuming large proportions, more especially in plums, for which British Columbia is specially noted. The markets of the Orient and Australia will in the near future also be outlets for the surplus fruits of the country. Canneries and fruit-preserving establishments of various kinds also afford means of disposing of some of the surplus fruits which are not in a condition to be exported. The high price of labor, and the competition which has to be met, in the matter of the cheap jams and other products, adulterated with foreign substances and glucose, which come from the east and California, are, however, very serious factors which militate against the success of such establishments."


345. Seeds of Canavalia ensiformis. Full size.

Pests.—Most of the pests which have caused such serious loss to the orchardists of other countries have made their appearance in the province, but, thanks to the efforts made for their suppression, the codlin moth and curculio are notable exceptions.

Climate.—The climate of the coast is most equable. The temperature seldom falls to zero nor rises above 75° or 80°. In the interior the variations are naturally greater, but even there, in the coldest part of the winter, the temperature does not long remain at or below zero. On the coast, the precipitation is almost entirely in the form of rain, which is sufficient for the most part for agricultural purposes, the objection being that little or none falls during the summer months. In the interior, where the precipitation is mostly in the shape of snow, it is so light that irrigation has to be resorted to. JOHN CRAIG.



346. The parts of the Canna flower. (See Canna, p. 238.)

CANAIGRE. See *Rumex hymenosepalus.*

CANARÌNA (from the Canary Islands). *Campanulàceæ.* Three species of tropical herbs closely allied to Campanula, but with the tubes of the calyx and corolla grown together, and the floral parts in 6's. *C. campanulata,* Linn., is a tender plant from the Canaries, with drooping, inflated buds and solitary, bell-shaped fls. more than 1 in. long and 1½ in. wide, dull yellow, flushed and veined with dull purplish brown. Lvs. hastate. B.M. 444.—Not in the Amer. trade.

CANARY-BIRD FLOWER is a *Tropæolum.*

CANARY GRASS is a *Phalaris.*

CANAVÀLIA (an aboriginal name). *Leguminòsæ.* Trailing or twining herbs: fls. in axillary racemes, with bell-shaped, 2-lipped calyx, papilionaceous corolla, 9 stamens united and 1 free for most of its length: pods large and ribbed on edges. Several species, widely distributed in warm countries.

ensifórmis, DC. (*C. gladiàta,* DC.). JACK BEAN. CHICKASAW LIMA. Figs. 197, 345. Grown in the southern states for stock, but the pods make passable snap beans when not more than 4 or 6 in. long. In warm countries it is a bushy plant, with little tendency to climb. The pods reach a length of 10–14 in., the walls being very hard and dense when ripe. The halves of the pod, when split apart, roll up spirally, often into an almost perfect cylinder. The large white, turgid beans, bearing a very prominent brown seed-scar, are packed crosswise the pod, imbedded in a very thin white, papery lining. The flowers are small and light purple, resembling those of the Cow-pea (though larger) and of various species of Dolichos. The leaflets are 3, large and broad (5–8 in. long and half or three-fifths as broad), strongly veined and dull, dark green, abruptly pointed and smooth. Tropics. A.G. 14:84. B.M. 4027.—Beans said to be used as a coffee substitute. L. H. B.

347. Old-time Canna.

348. Modern flowering Canna.

CANDLEBERRY, CANDLENUT. See *Aleurites.*

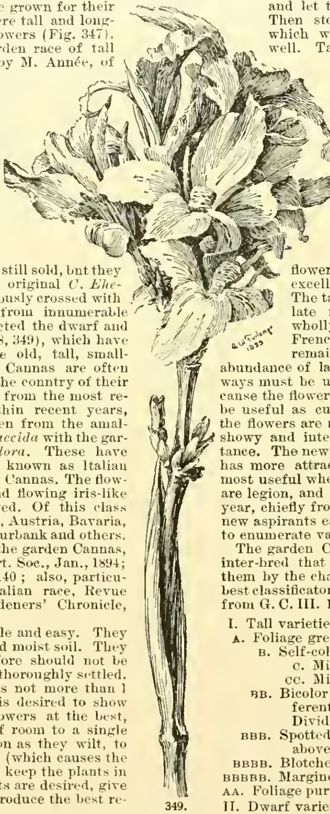
CANDYTUFT. See *Iberis.*

CANE-BRAKE. Species of *Arundinaria* (treated under Bamboo).

CANÍSTRUM. See *Æchmea.*

CÁNNA (name of oriental origin, of no application). *Scitaminàceæ.* Stout, unbranched, large-leaved tropical and warm-temperate herbs of both hemispheres, with large and ornamental foliage. Fls. mostly red or yellow, in a terminal raceme or panicle, very irregular: capsule 3-loculed and several–many-seeded (p, Fig. 346); sepals, *s*, 3 and small and usually green; petals 3, *ccc*, mostly narrow and pointed, green or colored; style single and long, *e*; the stamens are represented by petal-like, oblanceolate bodies or staminodia, *aaab*, 2 or 3 of which are usually much produced and broadened, and one is deflexed and narrower and forms the lip of the flower, *b*; the pollen is borne in a single-loculed anther, *f*, borne on the side of a narrow and more or less coiled staminodium.

A generation ago, Cannas were grown for their foliage or mass-effect. They were tall and long-jointed, with small and late flowers (Fig. 347). The parent of the old-time garden race of tall Cannas was *C. Annæi*, raised by M. Année, of France, from seeds of *C. Nepalensis*, sown in 1848. The flowers from which the seeds were taken probably had been pollinated by some other species, most likely with *C. glauca*. In 1863, a new race appeared, as the result of the union of *C. iridiflora* with *C. Warscewiczii*. This hybrid was known as *C. Ehemanni* (and *C. iridiflora hybrida*). This was of intermediate stature, with showy foliage and better drooping flowers. Under this name plants are still sold, but they may not be identical with the original *C. Ehemanni*. This race has been variously crossed with other species and forms, and from innumerable seedlings there have been selected the dwarf and large-flowered Cannas (Figs. 348, 349), which have now practically driven out the old, tall, small-flowered forms. These dwarf Cannas are often known as French Cannas, from the country of their origin; also, as Crozy Cannas, from the most renowned breeder of them. Within recent years, another race of Cannas has arisen from the amalgamation of our native *Canna flaccida* with the garden forms and with *C. iridiflora*. These have come mostly from Italy and are known as Italian Cannas; also, as orchid-flowered Cannas. The flowers are characterized by soft and flowing iris-like outlines, but they are short-lived. Of this class are the varieties Italia (Fig. 350), Austria, Bavaria, Burgundia, America, Pandora, Burbank and others. For a sketch of the evolution of the garden Cannas, see J. G. Baker, Journ. Roy. Hort. Soc., Jan., 1894; also, Bailey, Plant-Breeding, 140; also, particularly for the history of the Italian race, Revue Horticole, 1895, 516, and Gardeners' Chronicle, Dec. 14, 1895.



349. Flowering or French Canna — Prince Hohenlohe.

The culture of Cannas is simple and easy. They demand a warm, friable, rich and moist soil. They are injured by frost, and therefore should not be planted out until the weather is thoroughly settled. For mass effects, set the plants not more than 1 foot apart each way; but if it is desired to show individual plants and their flowers at the best, give three times that amount of room to a single plant. Pick the flowers as soon as they wilt, to prevent the formation of seeds (which causes the plant to lessen flowering), and keep the plants in tidy condition. If the best plants are desired, give the soil and treatment which produce the best results with Indian corn.

New varieties are raised from seeds. The seeds usually germinate slowly, and sometimes not at all, unless the hard integument is cut or filed, or is softened by soaking in water; these precautions taken, they germinate quickly. Sow late in winter, in rather strong bottom heat, either in flats or pots. Prick out, and give plenty of room as they grow. Commonly, Cannas are propagated by dividing the rootstock. This rootstock is a branchy mass, with many large buds. If stock is not abundant, as many plants may be made from a rootstock as there are buds, although the weak buds produce weak plants. Leave as much tissue as possible with each bud. These 1-bud parts usually give best results if started in pots, so that the plant is 6–12 in. high at planting time. The commercial Canna plants are grown mostly in pots. If one has sufficient roots, however, it is better not to cut so close, but to leave several strong buds on each piece (as shown in Fig. 351). These pieces may be planted directly in the ground, although more certain results are to be secured by starting them in the house in boxes or pots. If strong effects are desired, particularly in shrub borders, it is well to plant the entire stool. In the fall, when the plants are killed by frost and the tops have dried a few days, dig the roots, and let them dry as if they were potatoes. Then store them on shelves in a cellar which will keep Irish or round potatoes well. Take care that the roots do not become too warm, particularly before cold weather sets in; nor too moist. Well cured roots from well matured plants usually keep without difficulty.

Cannas are commonly used only in formal beds, but most excellent effects may be secured by scattering them singly or in very small clumps in the hardy border or amongst shrubbery. Against a heavy background of green, the gaudy flowers show to their best, and the ragged effect of the dying flowers is not noticed. They also make excellent center-pieces for formal beds. The tall-growing Cannas, with small and late flowers, have given way almost wholly to the modern race of Crozy or French dwarf Cannas, which usually remain under 4 ft. high, and give an abundance of large early flowers. The Canna always must be used for bold planting effects, because the flowers have not sufficient durability to be useful as cut flowers. As individual blooms, the flowers are not usually attractive, but they are showy and interesting in the mass and at a distance. The new race of Italian or Flaccida Cannas has more attractive flowers, but even these are most useful when on the plant. Of varieties there are legion, and many new ones are imported each year, chiefly from France; and there are so many new aspirants each year that it is not worth while to enumerate varieties in a cyclopedia.

The garden Cannas are now so much varied and inter-bred that it is no longer possible to classify them by the characters of the species. One of the best classificatory schemes is the following (adapted from G. C. III. 14: 432):

I. Tall varieties.
  A. Foliage green.
    B. Self-colored varieties.
      C. Minor flower-segments narrow.
      CC. Minor flower-segments broad.
    BB. Bicolor forms, in which the lip is of a different color from the other segments. Divided into C and CC, as above.
    BBB. Spotted varieties. Including C and CC, as above.
    BBBB. Blotched varieties. Including C and CC.
    BBBBB. Margined varieties. Including C and CC.
  AA. Foliage purple. Divisions as under A.
II. Dwarf varieties. Divisions as under I.

To many of the garden forms and hybrids specific Latin names have been given; but the following synopsis (adapted from Baker's "Synopsis of the Species of Cannas," in G.C. III. 13: 42, 70, 164, 196) gives a general view of the original species. The names here accounted for are: aurantiaca, 14; *aureovittata*, 4; *carnea*, 15; *cinnabarina*, 6; coccinea, 6; *commutata*, 14; compacta, 13; *crocea*, 14; *densifolia*, 5; *denudata*, 20; discolor, 19; *divaricata*, 20; edulis, 9; *Ehrenbergii*, 5; *esculenta*, 9; *excelsa*, 20; *exigua*, 5; Fintelmanni, 3; flaccida, 21; flavescens, 5; *floribunda*, 4; *formosa*, 6; *fulgida*, 6; *gigantea*, 7; glauca, 10; heliconiæfolia, 11; *humilis*, 5; Indica, 1; iridiflora, 22;

læta, 4 ; *Lagunensis*, 14 ; Lamberti, 2 ; lanuginosa, 12; latifolia, 7 ; *leptocheila*, 16 ; *leucocarpa*, 14 ; liliiflora, 23 ; limbata, 4 ; *longifolia*, 10 ; lutea, 14 ; *macrocarpa*, 14 ; *macrophylla*, 7 ; *maculata*, 14 ; *Mexicana*, 10 ; *Moritziana*, 14 ; *Nepalensis*, 16 ; *occidentalis*, 4 ; orientalis, 5 ; pallida, 14 ; paniculata, 20 ; patens, 4 ; pedunculata, 8 ; polyclada, 17 ; *polymorpha*, 16 ; *Portoricensis*, 6 ; *pulchra*, 5 ; *recurvata*, 4; *Reevesii*, 21; *Roscoeana*, 14 ; *rubra*, 6 ; *saturate-rubra*, 4 ; *Schlechtendahliana*, 3 ; *Sellowii*, 4 ; speciosa, 16 ; *spectabilis*, 4 ; *stolonifera*, 10 ; *sulphurea*, 14 ; *Surinamensis*, 6 ; sylvestris, 6 ; *Texensis*, 4 ; *Tinei*, 14 ; variabilis, 15 ; *variegata*, 4; *ventricosa*, 4; *vitellina*, 14 ; Warscewiczii, 18.

A. Eucanna. — *Corolla lobes and staminodia united into a short tube: two or three of the upper staminodia petal-like.*

B. *Three upper staminodia petal-like.*

C. *Lvs. of ordinary consistency or thickness.*

D. *Lip entire.*

1. **Índica**, Linn. Indian Shot. Stem slender, glabrous, green, 3–5 ft.: lvs. oblong and acute, green, half as broad as long (1 ft. long): racemes simple and lax, some of the fls. in pairs, the bracts green and nearly orbicular: fls. small; sepals oblong and green, ¼ in. long; petals lanceolate, pale green, about 1½ in. long; 3 upper staminodia bright red, entire, 2 in. long but narrow; lip linear, red-yellow, spotted with red; capsule globose, 1 in. in diam. W. Indies and Guiana.

2. **Lámberti**, Lindl. Stem stout, green and glabrous, 12–14 ft.: lvs. oblong, green, acute: raceme simple or forked, lax and few-fld., the bracts large and oblong, green: sepals lanceolate, pale green, ½in. long; petals lanceolate, 2 in. long, reddish; staminodia entire, scarcely longer than the petals, bright crimson; lip bright crimson: capsule oblong, large. W. Ind., S. Amer.

3. **Fíntelmanni**, Bouché. Stem green and glaucous. 4–5 ft.: lvs. oblong and acute, green and glaucous: raceme few-fld. and lax, the bracts green and oblong: sepals oblong, ⅓in., green; petals lanceolate, pale green, 1½in.; staminodia obtuse and entire, 2–3 in., yellow; lip oblanceolate, yellow, mottled red: capsule large. Trop. Amer.?—Possibly a hybrid of *C. glauca* and *C. Indica*. *C. Schlechtendahliàna*, Bouché, is similar, but has the staminodia spotted red.

DD. *Lip emarginate.*

4. **pàtens**, Roscoe. Stem slender, green and glabrous, 4–5 ft.: lvs. oblong and acute, green, the lower 1 ft. long: raceme few-fld., simple and lax, the bracts orbicular and green, the fls. single or in pairs: fls. small; petals lanceolate, pale green, about 1½in. long; upper staminodia bright red, entire, 2 in. long, and narrow; lip bright red-yellow, with minute red dots: capsule globose, 1 in. in diam. Trop. Amer. B.M. 454 as *C. Indica*.

Var. **limbàta**, Baker (*C. limbàta*, Roscoe. *C. aùreo-vittàta*, Lodd.). Upper staminodia bright red, with a border of bright yellow.—To *C. patens* Baker would refer the following: *C. floribunda*, *læta*, *recurvata*, *saturate-rubra*, *Sellowii*, *spectabilis*, *Texensis*, *variegata* and *ventricosa* of Bouché. *C. occidentalis*, Roscoe, has only 2 staminodia, petal-like.

5. **orientàlis**, Roscoe. Stem slender, glabrous, 3–4 ft.: lvs. oblong-lanceolate, a foot or more long: raceme lax, simple or forked, the bracts oblong: sepals oblong-lanceolate, green, ½in. or less long; petals lanceolate, greenish, 1½in. long; upper staminodia 2½in. or less long, bright red, often emarginate; lip red-yellow: capsule globose and very small. Old World tropics.

350. Italia Canna.

Var. **flavéscens**, Baker (*C. flavéscens*, Link). Upper staminodia and the lip entirely yellow.—With *C. orientalis* probably belong *C. densifolia*, *Ehrenbergii*, *exigua*, *humilis* and *pulchra* of Bouché.

6. **coccínea**, Miller (*C. rùbra*, Willd.). Stem slender, green, 4–6 ft.: lvs. longer than those of *C. Indica*, oblong and acute: raceme simple and lax, with small, green, orbicular bracts: sepals lanceolate, ½in. or less long, tinged with red; petals lanceolate, 1½in. long, tinged with red; staminodia 2 in. long and narrow, often emarginate; lip red-yellow: capsule globose and small. Trop. Amer.—To this species Baker would refer *C. cinnabarina*, *formosa*, *fulgida*, *Portoricensis* and *Surinamensis* of Bouché.

Var. **sylvéstris**, Baker (*C. sylvéstris*, Roscoe). Staminodia longer, plain deep crimson, that and the lip with a long claw. Trop. Amer.

7. **latifòlia**, Miller (*C. gigantèa*, DC. *C. macrophýlla*, Bouché). Stem stout and pubescent, 10–16 ft.: lvs. oblong and acute, green, the lower ones often 3–4 ft. long: fls. in several racemes forming a panicle, the bracts oblong or the lower ones becoming several inches long; sepals oblong and green, ½ in. long; petals lanceolate, 2 in. long, tinged with red; staminodia 3 in. or less long, entire or emarginate, bright red; lip bright red: capsule large. S. Amer. B.M. 2316.

8. **pedunculàta**, Sims. Stem slender, green and glaucous, glabrous, 5–6 ft.: lvs. oblong-lanceolate, green and glaucous, 1–2 ft. long and 3–4 in. broad: fls. in a many-fld. lax raceme, with a hairy rachis and long-spreading pedicels, the bracts small, oblong and obtuse; sepals oblong, small and green; petals lanceolate, green, reflexed, 1 in. long; staminodia emarginate, about 1 in. long, pale yellow; lip oblanceolate, plain yellow: capsule globose, small. S. Brazil. B.M. 2323.—Probably not in cult.

9. **édulis**, Ker. (*C. esculénta*, Lodd.). Rootstock thick and edible: stem stout, 8–12 ft., purple: lvs. oblong, green or bronze, 1–2 ft. long: raceme lax, forked or simple: fls. usually in pairs; bracts orbicular or oblong; sepals oblong-lanceolate, ½in. long, tinged with red; petals lanceolate, 1½–2 in.; staminodia entire or emarginate, 2½in. long, bright red or orange; lip bright red or yellow-red: capsule large. Trop. Amer. B.M. 2498.—Starch is procured from the roots, and for this purpose the plant is widely cult. in the tropics.

10. **glaùca**, Linn. Stem green and glaucous, 5–6 ft.: lvs. green and glaucous, oblong-lanceolate and very acute, tapering both ways (the middle of the blade about 4 in. wide): raceme lax, simple or forked: sepals lanceolate, green, ½in. long; petals lanceolate, yellow-green, 1½–2 in.; staminodia entire, 2½–3 in., yellow, not spotted; lip linear, emarginate, pale yellow: capsule oblong, 1½–2 in. long. Trop. Amer.— The *C. longifolia*, *Mexicana* and *stolonifera* of Bouché belong here.

CC. *Lvs. thin and papery.*

11. **heliconiæfòlia**, Bouché. Stem 6–8 ft.: lvs. oblong, green, 2–3 ft. long (resembling those of *Heliconia*): fls. in a panicle formed of several lax racemes; sepals lanceolate, ½in. long; petals lanceolate, ½in. long, colored; staminodia not much longer than the petals, scarlet; lip scarlet: capsule ellipsoidal, large. Mex.

BB. *Two upper staminodia petal-like.*

C. *Stem woolly-pubescent.*

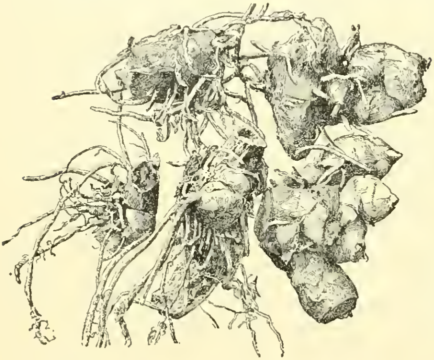
12. **lanuginòsa**, Roscoe. Stem green, woolly, 4–6 ft.: lvs. oblong, acute, green: raceme lax, few-fld., simple.

or forked, the bracts obtuse, small and green: sepals lanceolate, green, ½in. or less long; petals lanceolate, 1½ in. long, tinged with red; staminodia entire, red or red-yellow; lip the same color, oblanceolate and emarginate. Brazil.

CC. *Stem glabrous.*

D. *Leaves green.*

13. **compácta,** Roscoe. Stem stout and green: lvs. broad, oblong and acute: raceme simple and many-fld., dense: sepals lanceolate, ½in. long; petals unequal, lanceolate, 1½ in. long, red-yellow; staminodia slightly emarginate, 1½–2 in. long, bright crimson; lip emarginate, red-yellow. Trop. Amer.



351. Stool of Canna, showing how it may be divided.

14. **lùtea,** Miller. Stem slender and green, 3–4 ft.: lvs. oblong and acute: raceme lax, simple or forked, the small green bracts oblong and obtuse: sepals greenish, oblong, ⅓in.; petals lanceolate, pale green, 1–1¼ in. long; staminodia pale yellow, often emarginate, 1½–2 in. long; lip linear, pale yellow, emarginate. Trop. Amer.

Var. **pállida,** Roscoe. Staminodia and lip pale yellow, spotted red.

Var. **aurantìaca,** Roscoe (*C. Tínei,* Todaro). Petals tinged red; staminodia red-yellow; lip red-yellow and red-spotted.—To *C. lutea* are to be referred *C. commutata, leucocarpa, Moritziana,* and *Roscoeana,* of Bouché; *C. crocea,* Lag.; *C. Lagunensis,* Lindl.; *C. maculata,* Link; *C. macrocarpa, sulphurea* and *vitellina,* of Horaninow.

15. **variábilis,** Willd. (*C. cárnea,* Roscoe). Stem green, 3–4 ft.: lvs. oblong and acute: raceme simple and lax, the small bracts oblong and obtuse: sepals lanceolate, green, ½in. long; petals lanceolate, 1½ in. long, pale green; staminodia pale red, entire; lip linear and entire. Brazil.

16. **speciòsa,** Roscoe (*C. leptochèlla* and *polymórpha,* Bouché). Stem green, 5–6 ft.: lvs. broad-oblong, acute: fls. in a deeply forked, long-branched panicle; sepals lanceolate, ¾in. long, pale red; petals lanceolate, 2 in. long, pale red; staminodia 3 in. long, emarginate, bright red; lip emarginate, bright red-yellow. Himalayas. B.M. 2317.—*C. Nepalénsis,* Wall., has 3 upper staminodia.

DD. *Lvs. bronze or brown, at least on the margins.*

17. **polyclàda,** Wawra. Stem tall and slender: lvs. oblong and acute, base rounded, brown-edged: fls. (often in pairs) in a long, much-branched panicle, the bracts nearly orbicular; sepals lanceolate, ½in. long; petals lanceolate and unequal, the longest 2 in., tinged red; staminodia acute, not longer than the petals, bright crimson; lip oblanceolate, the claw yellow-spotted, the limb bright crimson. Brazil.

18. **Warscewiczii,** Dietr. Stem claret-purple and glaucous, 3–4 ft.: lvs. oblong and acute, more or less claret- or bronze-tinged: raceme simple and rather dense, with ovate, brown, glaucous bracts: sepals lance-oblong, ½in., glaucous; petals lanceolate, 2 in. long, reddish and glaucous; staminodia (sometimes 3) entire or nearly so, 2½–3 in. long, bright scarlet; lip oblanceolate, emarginate, bright scarlet. Costa Rica. B. M. 4854.

19. **díscolor,** Lindl. Stem stout, 6–10 ft., purple and glaucous: lvs. broad-oblong, acute, brown-tinted, the lower ones sometimes 3 ft. long: fls. in a deeply forked panicle of lax racemes, the bracts small and orbicular; sepals lanceolate, ½in. long, green; petals lanceolate, 1½ in. long, pale green; staminodia entire, 2½ in. long, bright red; lip lanceolate and emarginate, brick-red. Trop. Amer.

AA. DISTEMON.—*Corolla tube short: upper staminodia suppressed.*

20. **paniculàta,** Ruiz & Pav. (*C. denudàta,* Roscoe. *C. excélsa,* Lodd. *C. divaricàta,* Klotsch). Stem tall and slender, glabrous: lvs. oblong and acute, green and glabrous: racemes lax, disposed in a large panicle; sepals lanceolate, ½in. long; petals lanceolate, yellow-green, 2–3 in. long; lip rather longer than the petals, crimson. S. Brazil.

AAA. EURYSTYLUS.—*Corolla tube 2–2½ in. long: 3 staminodia produced, clawed: lip orbicular.*

21. **fláccida,** Salisb. (*C. Reèvesii,* Lindl.). Stem green and glabrous, 4–5 ft., very leafy below: lvs. oblong-lanceolate, green: raceme simple, lax and few-fld., the bracts very small: sepals lanceolate, 1 in. long, green; corolla lobes lanceolate and reflexed, nearly as long as the tube; 3 upper staminodia obovate, sulfur-yellow, 2–3 in. long by 1 in. broad; lip large, yellow. Swamps, S. Car. to Fla., near the coast. L.B.C. 6: 562.—Useful for its good habit and iris-like fls.

AAAA. ACHIRIDIA.—*Tube of corolla and staminodia as long as the blade: fls. large and pendulous.*

22. **iridiflòra,** Ruiz & Pav. Stem green, 6–10 ft.: lvs. oblong, bright green, slightly pubescent beneath: racemes paniculate, drooping: sepals lanceolate, 1 in. long, green; corolla lobes lanceolate, red-brown, 2½in. long; 3 upper staminodia somewhat longer than the corolla lobes, obovate, nearly or quite 1 in. broad, rose-crimson; lip narrow, deeply emarginate, rose-crimson. Andes of Peru. B.M. 1968. R.H. 1861: 110.

23. **liliiflòra,** Warscew. Stem robust, green, 8–10 ft.: lvs. many, oblong, green, 3–4 ft. long, spreading from the stem at a right angle: fls. in a corymbose panicle; sepals linear, as long as the tube of the corolla; corolla lobes lanceolate, 2–3 in. long, pale green, the tube of equal length; 3 upper staminodia white, united into a tube for half their length, the blade obovate and spreading; lip oblanceolate, as long as the staminodia. Colombia. R. H. 1884: 132. F. S. 10: 1055–6.—A fine species. The white fls. finally become tinged with brown; lonicera-scented.

L. H. B.

CÁNNABIS (the ancient Greek name). *Urticàceæ.* HEMP. A single species, probably native to central Asia, and now widely cult. as a fiber plant. Hemp is also grown occasionally as an ornamental plant, being grown from seeds and treated as a half-hardy annual. It makes excellent screens in remote places. It thrives best in a rich, rather moist soil. **C. sativa,** Linn., is the only species, but various forms have received specific names. In gardens, the form known as *C. gigantèa* is commonest; this reaches a height of 10 ft. and more. The seeds are usually sown where the plants are to stand; but if quick effects are wanted, they may be started indoors in pots or boxes. Hemp is diœcious. The staminate fls. are in axillary panicles, and have 5 sepals and 5 drooping stamens. The pistillate fls. are in short spikes, with 1 sepal folding about the ovary. Lvs. digitate, with 5–7 nearly linear, coarse-toothed leaflets. The plant is annual, roughish and strong-smelling.

L. H. B.

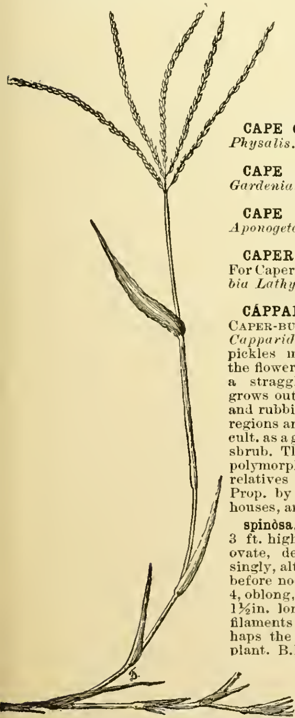
CANTERBURY BELL. See *Campanula Medium.*

CÁNTUA (from Cantu, Peruvian name). *Polemoniàceæ.* Ten species of South American flowering shrubs with very variable foliage and showy, tubular fls. of various colors. *C. buxifolia* is cult. out of doors in S. Calif., and is recommended in Europe as a coolhouse shrub. Probably no tenderer than Fuchsias. Prop. by cuttings.

buxifòlia, Lam. (*C. depéndens,* Pers.). Much branched shrub, about 4 ft. high; branches more or less downy: lvs. very variable, generally oblong-obovate, acute, tapering at the base, entire or serrate, downy or glabrous: fls. 5–8, drooping vertically, in a kind of leafy, terminal corymb; calyx pale, membranous, green-streaked, 5-toothed, a fourth shorter than the corolla tube; corolla long-funnel-shaped, the tube 2½in. long, red, usually streaked; limb of fringed, obcordate, crimson lobes: stamens included. Peru. B.M. 4582. F.S. 7:650. R.H. 1858, p. 294.—One of the choicest of European greenhouse plants. Very liable to red spider in our climate.

C. bícolor, Lem. Distinguished from the above by the entire lvs., which are shorter, about 1 in. long, and the solitary fls., with a short, yellow tube, the limb not fringed. The fls. droop, but not vertically. Peru. B.M. 4729. F.S. 4:343. Probably less desirable than the above.—*C. pyrifòlia,* Pers. Lvs. generally broader and more toothed than in C. bicolor: fls. as many as 17, in an erect, terminal, compound corymb; calyx red-tipped, nearly half as long as the yellow corolla tube; corolla about 1¼in. long, with a white limb: stamens long, exserted. Peru. B.M. 4386. F.S. 4:383.

W. M.


352. Capriola Dactylon. Nat. size.

CAPE BULBS. Treated under *Bulbs.*

CAPE CHESTNUT is *Calodendrum Capensis.*

CAPE GOOSEBERRY is a *Physalis.*

CAPE JESSAMINE. See *Gardenia.*

CAPE PONDWEED. See *Aponogeton.*

CAPER. See *Capparis.* For Caper-spurge, see *Euphorbia Lathyrus.*

CÁPPARIS (Greek, *caper*). Caper-bush, or Caper Tree. *Capparidàceæ.* Capers are pickles made by preserving the flower buds of *C. spinosa,* a straggling shrub which grows out of old walls, rocks, and rubbish in Mediterranean regions and India. Also rarely cult. as a greenhouse flowering shrub. The genus is large and polymorphic, and none of its relatives are familiar north. Prop. by cuttings in greenhouses, and by seeds south.

spinòsa, Linn. Spiny shrub, 3 ft. high: lvs. roundish or ovate, deciduous: fls. borne singly, alternately, and fading before noon; sepals 4; petals 4, oblong, clawed, wavy, white, 1½in. long: stamens 40–50: filaments purple above, perhaps the chief beauty of the plant. B.M. 291.—What seems to be the long style with a short, unopened stigma, is really the elongated peduncle or torus topped by the pistil, which has no style and a minute stigma.

W. M.

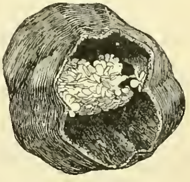
CAPRIFÒLIUM. See *Lonicera.*

CAPRÌOLA (the *wild goat,* which feeds upon this grass). *Gramíneæ.* Low, creeping perennials, with short, flat leaves and slender spikes, which spread out at the apex into finger-like branches. Spikelets 1-fld., awnless, sessile, in two rows along one side of a slender, continuous axis. Glumes 3, the first 2 narrow, keeled, usually acute, empty; the third or floral glume broader and usually a little longer than the empty ones. Species 4. One distributed throughout the tropical and warmer temperate regions of the world.

Dáctylon, Kuntze (*Cýnodon Dáctylon,* Pers.). Bermuda Grass. Fig. 352. A widely dispersed grass, with a creeping habit of growth, extending rapidly over the surface of the ground and rooting at the joints. Used extensively in the south for lawn-making, where Kentucky blue grass and the bent grasses cannot be successfully grown. Except in the far south, however, it is not a desirable lawn grass, as it quickly turns brown upon the approach of cold weather, and is rather late in becoming green in the spring. A variety known as St. Lucie Grass is regarded as a more desirable form for lawns than the species. Experiments made in central Michigan by Beal seem to show that Bermuda Grass is valuable to mix with June grass for a lawn where the soil is rather thin, the June grass occupying the soil from early spring until hot, dry weather, when the Bermuda covers the ground. In the cool autumn, June grass appears again at the surface.

P. B. Kennedy.

CÁPSICUM (name of uncertain origin, perhaps from *kapto,* to bite, on account of the pungency of the seed or pericarp; or from *capsa,* a chest, having reference to the form of fruit). *Solanàceæ.* Red Pepper. Cayenne Pepper. Herbs or shrubs, originally from trop. Amer., but escaped from cultivation in Old World tropics, where it was once supposed to be indigenous. Stem branchy, 1–6 ft. high, glabrous or nearly so: lvs. ovate or subelliptical, entire, acuminate: fls. white or greenish white, rarely violaceous, solitary or sometimes in 2's or 3's; corolla rotate, usually 5-lobed; stamens 5, rarely 6 or 7, with bluish anthers dehiscing longitudinally; ovary originally 2-3-loculed: fr. a juiceless berry or pod, extremely variable in form and size, many-seeded, and with more or less pungency about the seeds and pericarp. Fig. 353. The fruit becomes many-loculed and monstrous in cultivation. About 90 species have been named, most of which are now considered forms of one or two species. Monogr. by Irish, 9th Ann. Rept. Mo. Bot. Gard. For culture, see *Pepper.*


353. Normal 2-loculed fruit of Capsicum, in cross section.

A. *Annual or biennial.*

ánnuum, Linn. Herbaceous or suffrutescent, grown as annuals in temperate climates, but in warmer latitudes often treated as biennials. All of the leading commercial varieties in the United States readily find classification within the types or botanical varieties. The species has never been found wild.

B. *Fruit oblong-linear.*

C. *Calyx usually embracing base of fruit.*

Var. **conoïdes,** Irish (*C. conoïdes,* Miller). Suffrutescent: lvs. numerous, rather small, 2–3 in. long, ¾–2 in. wide: peduncles slender, straight, erect: fls. small; calyx obconical or cup-shaped, usually embracing base of fruit; corolla greenish white, spreading, ⅜–⅝in.: fr. erect, subconical or oblong cylindrical, about 1¼in. long or less, usually shorter than the peduncles and mostly borne above the lvs., very acrid. Coral Gem, Tabasco.

Var. **fasciculàtum,** Irish (*C. fasciculàtum,* Sturt.). Stem herbaceous, round or nearly so: branches few: lvs. clustered or crowded in bunches about the summit, elliptical-lanceolate, pointed at both ends: fr. also clustered, erect, slender, about 3 in. long by ¼in. in diam., very acrid. This is the Red Cluster Pepper.

Var. **acuminàtum,** Fingerh. (*C. Chilénse*, Hort.). Herbaceous, very branchy, about 2½ft. high, bearing a dense mass of foliage: fl. medium size, spread ½–¾in.: fr. larger than the preceding, either erect or pendent. Chile. Long Cayenne.

cc. *Calyx not usually embracing base of fruit.*

Var. **lóngum,** Sendt. (*C. ánnuum*, Linn. *C. lóngum*, DC.). Plants herbaceous, about 2½ft. high, with comparatively few branches: lvs. large, often 4 in. long by 2½in. wide: fl. large; corolla spreading, ⅞–1¼in., dingy white; calyx usually pateriform or funnel-form, rarely embracing base of fruit: fr. often a foot long by 2 in. in diam. at base; flesh thick and in some varieties very mild. Black Nubian, County Fair. Elephant's Trunk, Ivory Tusk.

bb. *Fruit of various shapes, but not oblong-linear.*

Var. **gróssum,** Sendt. (*C. gròssum*, Linn.). Fig. 354. Herbaceous, about 2 ft. high, with few branches: lvs. very large, often 3 by 5 in., sometimes coriaceous, lower ones usually pendent; petioles deeply channeled: peduncles stout, about 1 in. long; corolla large, spreading, ⅞–1¼in.: fr. large, oblate, oblong, or truncated, 3–4-lobed, usually with basal depression, more or less sulcate and rugose; flesh thick, firm, and of a mild flavor. Emperor, Monstrous, Bell, Sweet Mountain, Golden Dawn, Ruby King, Golden King, Brazilian Upright, Golden Upright, Squash.

354. Foliage and flowers of Capsicum annuum, var. grossum.

Var. **abbreviàtum,** Fingerh. (*C. umbilicàtum*, Vell. *C. lùteum*, Lam.). Suffrutescent: lvs. broadly ovate, 2–4 in. long: peduncles slender, straight or curved, as long as or longer than the berry: fr. about 2 in. long or less, varying much in the different horticultural varieties, in general ovate, quite rugose, except in one variety, sometimes turbinate. While this variety is used to some extent for pickling, it is noted more as an ornamental plant. Celestial, Etna, Kaleidoscope, Red Wrinkled, Yellow Wrinkled.

Var. **cerasifórme,** Irish (*C. cerasifórme*, Miller). Fig. 355. Suffrutescent: lvs. medium size, ovate or oblong acuminate, about 1¼–3½in.: calyx seated on base of fruit; corolla large, spreading, ⅞–1½in.: fr. spherical, subcordate, oblate, or occasionally obscurely pointed or slightly elongated, smooth or rarely minutely rugose or sulcate; flesh firm, one-twelfth–⅛in. thick, extremely pungent. Cherry, Yellow Cherry, Oxheart.

aa. *Perennial.*

frutéscens, Linn. Fig. 356. Shrubby, perennial, 3–6 ft. high, with prominently angled or somewhat channeled stem and branches: branches loosely spreading or trailing: lvs. broadly ovate acuminate, 3–6 in. long, 2–3½in. wide: peduncles slender, 1–2 in. long, often in pairs, usually longer than the fruit: calyx cup-shaped, embracing base of fruit; corolla often with ocherous markings in the throat: fr. red, obtuse or oblong-acuminate, ¾–1¼in. long, ¼–¾in. in diam., very acrid.—Cultivated only in the south, as the seasons in temperate latitudes are not long enough to mature the fruit.

355. Capsicum annuum, var. cerasiforme (× ½).

Var. **baccàtum,** Irish (*C. baccàtum*, Linn.). Plants not as tall, but more erect than the species: branches slender, fastigiate, flexuose: corolla small, spreading, about ½ in.: fr. ovate or subround, about ¼in. in diam.

H. C. Irish.

CARAGÀNA (*Caragan*, its Mongolian name). *Leguminòsæ*. Pea Tree. Shrubs or small trees: lvs. deciduous, abruptly pinnate, often with spiny-pointed and persistent rachis; lfts. small, entire, mucronulate; stipules deciduous or spiny and persistent: fls. papilionaceous, axillary, solitary or fascicled, usually yellow: fr. a linear pod. About 20 species from S. Russia to China. Ornamental shrubs, with handsome yellow fls., appearing late in spring or early in summer; quite hardy, except a few Himalayan species. They grow in almost any soil, but best in a sandy soil and sunny position, and are well adapted for shrubberies. *C. arborescens* is the only one which grows into a small tree, and is of upright habit, like *C. frutescens*, which is about half as high and more graceful; all the other species are low shrubs, of usually spreading habit. Prop. by seeds sown in fall or in spring; if kept dry during the winter, soaking in tepid water for 2 or 3 days before sowing will be of advantage; also, increased by root-cuttings and layers, or by grafting on seedling stock of *C. arborescens* in spring.

a. *Lfts. 8–18: rachis of the lvs. deciduous.*

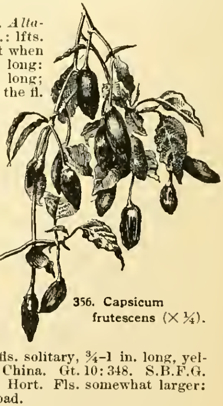
arboréscens, Lam. Shrub or small tree, to 20 ft.: lfts. 8–12, obovate or oblong, sparsely pubescent beneath or glabrous at length, ½–1 in. long: fls. 2–4, pale or bright yellow, ¾in. long; pedicels usually longer than the fls. May, June. Siber., Manchuria.—There are some varieties, of which var. **péndula,** Hort., with pendulous branches, is the most remarkable; it should be grafted high.

microphýlla, Lam. (*C. Altagàna*, Poir.). From 4–6 ft.: lfts. 12–18, obovate, pubescent when young, one-sixth–⅓ in. long: fls. 1 or 2, yellow, ¾in. long; pedicel about as long as the fl. Siber., China. L. B. C. 11: 1064. — Under this name a dwarf form of the former is often cultivated.

aa. *Leaflets 2–4.*

b. *Rachis of the lvs. deciduous: pedicels as long as or longer than the fls.*

frutéscens, DC. (*C. frùtex*, C. Koch). Fig. 357. From 6–10 ft.: lfts. 4, approximate, nearly digitate, cuneate, obovate or oblong, rounded or emarginate at the apex, glabrous, ⅓–1 in. long: fls. solitary, ¾–1 in. long, yellow. May. S. Russia to China. Gt. 10: 348. S.B.F.G. 3: 227.—Var. **grandiflòra,** Hort. Fls. somewhat larger: lfts. usually large and broad.



356. Capsicum frutescens (× ¼).

BB. *Rachis persistent, spiny: pedicels shorter than the fls.*

Chámlagu, Lam. Shrub, 2–4 ft.: spines long: lfts. 4, in 2 somewhat remote pairs, chartaceous, obovate, emarginate or rounded at the apex, glabrous, ¼–¾ in. long: fls. solitary, reddish yellow, 1¼ in. long. May. N. China.

357. Caragana frutescens. (½.)

pýgmæa, DC. One to 3 ft.: spines short, ¼ in.: lvs. nearly sessile; lfts. 4, approximate and almost digitate, cuneate, linear-elliptic or linear-lanceolate, glabrous, ⅓–½ in. long: fls. solitary, ¾ in. long, golden yellow. Cauc. to Siber. and Thibet. B. R. 12: 1021. —Grafted high on *C. arborescens*, it forms a graceful, standard tree, with pendulous branches.

grandiflòra, DC. Similar to the former. Lfts. cuneate-oblong: fls. 1¼ in. long; calyx gibbous at the base. Cauc. — Under this name mostly a variety of *C. frutescens* is cultivated.

C. Altagàna, Poir.=C. microphylla.—*C. arboréscens arenària*, Hort.=C. microphylla.—*C. arenària*, Dipp.=C. aurantiaca, Koehne.—*C. arenària*, Loud., see C. cuneifolia.—*C. aurantiàca*, Koehne. Allied to C. pygmæa. Fls. orange-yellow: calyx as long as broad: ovary glabrous. Siber.—*C. brevispìna*, Royle. Spines 2–3 in. long: lfts. 12–16, pubescent: fls. 2–4, on a common peduncle. Himal. P. F. G. 2: 184.—*C. cuneifòlia*, Dipp. (C. Redowskii, Hort., not DC.). Probably var. of C. arborescens. Stipules spiny: lfts. small, cuneate; pedicels shorter, pubescent: seeds brown, spotted black. C. arenaria, Loud. (B. M. 1886), seems to be the same.—*C. frùtex*, C. Koch=C. frutescens—*C. Gerardiàna*, Royle. Spines 1½–2 in. long: stipules large, scarious: lfts. 8–12, densely pubescent: fls. 1–2, short-pedicelled. Himal.—*C. grácilis*, Hort.=C. pygmæa—*C. jubàta*, Pall. Branches spiny, villous, thick, with rounded lvs.: stipules large, scarious: lfts. 8–10, villous beneath: fls. whitish, short-pedicelled. Siber. F.S. 19:2013. L.B.C. 6:522. Gt. 10:331. A very distinct and curious looking species; hardy.—*C. Redòwskii*, Hort., not DC.=cuneifolia, Dipp.—*C. spinòsa*, DC. Spines 1 in. long: lfts. 4, rarely more, approximate, cuneate-lanceolate, glabrous: fls. solitary, short-pedicelled. Siber.—*C. spinosíssima*, C. Koch=C. spinosa.—*C. tragacanthoìdes*, Poir. Spiny: lfts. 4–8, cuneate, oblong, pubescent: fls. solitary, short-pedicelled; calyx villous-pubescent. Himal.—*C. triflòra*, Lindl.=C. brevispina.—*C. vulgàris*, Hort.=C. arborescens.

ALFRED REHDER.

CARAGUÁTA. By the latest monographer referred to Guzmania, which see.

CARAMBÒLA. See *Averrhoa*.

CARAWAY (*Càrum Càrui*, Linn.). *Umbellíferæ.* A biennial or annual herb grown for its seeds, which are used in flavoring bread, cakes and cheese; also occasionally for the young shoots and leaves, which are eaten. It grows a foot or two high, has finely-cut, pinnately compound foliage, and small white flowers in umbels. It is of the easiest culture. The seed is usually sown in spring and the crop of seed taken the following year. It thrives in any garden soil. The plant occasionally runs wild. See *Carum*.

CARBÈNIA (name of doubtful meaning). *Compósitæ.* BLESSED THISTLE. A monotypic genus allied to Centaurea, and distinguished from it botanically by involucre, achenes, pappus and anthers. Its habit in the garden is very different from the Bachelor's Buttons, being thistle-like, and more interesting than ornamental. A hardy annual, low-growing herb, rough, branching and pilose. Once thought to counteract poison. Culture easy. Fit for wild gardens and rockeries.

benedicta, Adans. (*Cárduus benedíctus*, Authors. *Cnìcus benedíctus*, Linn. *Centaurèa benedícta*, Linn.). Fig. 358. Height 2 ft.: lvs. alternate, sinuate-pinnatifid, the lobes and teeth spiny: fls. terminal, yellow, 1 in. wide. Mediterranean regions and Caucasus. Sometimes cult.; also rarely seen in waste places of southern Atlantic states and Calif. as a weed adventive from Eu.

CARDÁMINE (Greek name of a cress). *Cruciferæ.* Small perennials growing in low, rich land, blooming in spring or early summer. Petals obovate or spatulate; pods linear and straight, the wingless seeds in 1 row.

praténsis, Linn. CUCKOO FLOWER. Plant slender and usually glabrous, 12–20 in., somewhat branched: lvs. pinnately divided; lfts. of root lvs. small and rounded (⅛ in. or less across), those of the upper stem-lvs. oblong or even linear and entire or somewhat toothed: fls. ½ in. long, in a corymb, white or rose-color, pretty. Eu. and Amer., in the northern parts.—In the gardens it is chiefly known in the double-fld. form, which probably has been obtained from European rather than American sources. There are other forms of it. It is an excellent little plant to grow in moist places, particularly along creeks and about springs. It is also useful in drier places, as in rockeries.

angulàta, Hook. Erect, 1–2 ft. high: lvs. 3–5-foliolate, the lfts. ovate or oblong and the middle one usually coarsely toothed: fls. rather large, white, in short, few-fld. racemes. Mts. of Ore. and Wash.—Int. 1881 by Gillett.

C. gemmàta, int. by Pilkington, 1892, is evidently Dentaria macrocarpa.

L. H. B.

CARDAMON. See *Amomum* and *Elettaria*.

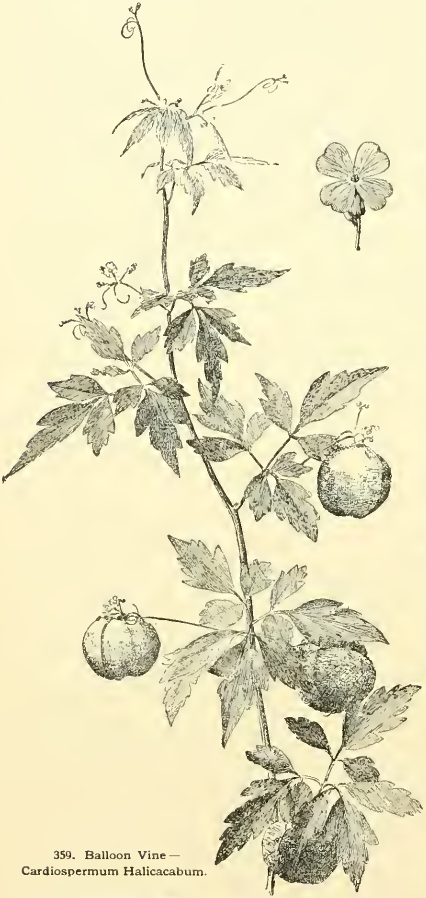
358. Carbenia benedicta.

CARDIÁNDRA (Greek, *heart*, and *man* or *stamen*: alluding to the shape of the anthers). *Saxifragàceæ.* Low deciduous shrub, allied to Hydrangea, with alternate, rather large lvs.: fls. in terminal, loose corymbs, small, those of the margin large, radiant and sterile. One species in S. Japan and China. Tender and suffruticose, thriving in any good garden soil; best in a partly shaded position. Prop. by greenwood cuttings under glass

alternifòlia, Sieb. & Zucc. 1–3 ft.: lvs. broadly elliptic to elliptic-lanceolate, tapering into a very short

petiole, coarsely serrate, sparsely pilose, membranaceous, 3–7 in. long: fls. white, tinged red. Summer. S Z. 66, 67.
Alfred Rehder.

CARDINAL FLOWER. *Lobelia cardinalis.*



359. Balloon Vine — Cardiospermum Halicacabum.

CARDIOSPÉRMUM (Greek, *heart-seed*, from the white heart-shaped spot on the round black seed; hence the plant was thought a cure for heart diseases). *Sapindàceæ.* Thirty tropical American species of climbing herbs, with alternate, biternate lvs., coarsely serrate lfts., and small white fls. in axillary racemes or corymbs. The most popular is the interesting Balloon Vine, which is a rapid-growing, tender annual, curious for its inflated seed-vessels.

Halicácabum, Linn. Fig. 359. Height, 10 ft.: stem and branches grooved: balloons an inch or more thick. E. and W. Indies. B.M. 1049.—A general favorite, especially with children.
W. M.

CARDOON (*Cynàra Cardúnculus*, Linn.). A thistle-like plant of southern Europe, cult. for the thick leafstalk and midrib. It is thought to be of the same species as the artichoke, and to have been developed from it by long cultivation and selection. The plant has been introduced into South America, and has run wild extensively on the pampas. Darwin writes that "no cultivated plant has run wild on so enormous a scale as the Cardoon." From the artichoke it differs in taller and more prickly growth and smaller heads. The Cardoon is perennial, but it is not hardy, and is treated as an annual. Seeds are sown in spring, either in pots under glass or in the open where the plants are to stand. The later sowing is usually preferred. The plants are given rich soil and should have abundant moisture supply, for they must make continuous and strong growth. When the leaves are nearly full grown, they are tied together near the top, straw is piled around the head, and earth is banked against it. This is to blanch the plant, for it is inedible unless so treated. From two to four weeks is required for the blanching. The procedure is not very unlike that adopted for the blanching of celery or endive. If the plants are late, they may be dug just before frost and blanched in a storage pit. The plants are usually grown from 2–3 ft. apart in rows which are 4 ft. apart. They are sometimes grown in trenches, after the old manner of growing celery. Cardoon is almost unknown in America, except amongst foreigners.
L. H. B.

CÁRDUUS. For *C. benedictus*, see *Carbenia*.

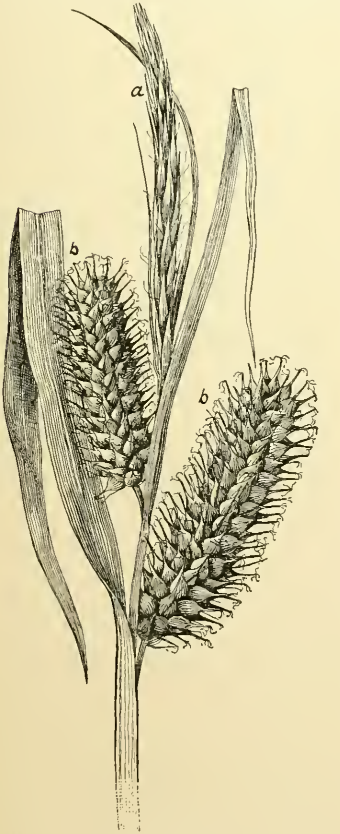
CÀREX (name of obscure origin). *Cyperàceæ.* Sedge. Hundreds of grass-like plants in temperate climates. Fls. unisexual, in spikes, the staminate naked and subtended by a bract or scale, the pistillate comprising a single pistil enclosed in a thin sac or perigynium. The two sexes may be in the same or separate spikes; and rarely they are on different plants (plant diœcious). Carices are very abundant in cool temperate regions, both in species and in individual plants. Many of them grow on dry land, but the largest species grow in low grounds and swales, and often form much of the bulk of bog hay (Fig. 360). The species are very difficult to distinguish because they are very similar, and the study of them is usually left to specialists. Some of our broad-leaved native species make excellent borders and interesting clumps in corners about buildings and along walls. Many of the lowland species are excellent adjuncts to the pond of hardy aquatics. Others have very graceful forms, with drooping spikes and slender culms (Fig. 361). The following native species have been offered by collectors: *aurea, eburnea, flava, Grayi, hystricina, lupulina* and its var. *pedunculata, lurida, Magellanica, Pennsylvanica, plantaginea, Pseudo-Cyperus, retrorsa, Richardsoni, riparia, Tuckermani, utriculata, vulpinoidea.* The following species are in the Amer. trade:

362. Carex Morrowi.

Mórrowi, Boott. (*C. Japónica*, Hort., not Thunb. *C. tenuíssima*, Hort. *C. acutifòlia*, Hort.). Fig. 362.

Lvs. stiff and evergreen, long-pointed, in the common garden form with a white band near either margin: culm 1 ft., with a terminal staminate spike and two or three slender pistillate spikes (1 in. long) from sheaths: perigynium small and firm, somewhat excurved, 2-toothed, glabrous. Jap. G.C. III. 13:173. R.B. 20, p. 9. —A very handsome plant, suited for pots or the border. The stiff, clean, white-edged foliage keeps in condition for months, making the plant useful for decorations in which pot-plants are used. It is perfectly hardy in central New York, holding its foliage all winter. A useful florists' plant.

tenària, Hort. (*C. tènera*, Hort.). Slender but stiff: lvs. narrow, rolling more or less when dry: staminate spikes long-stalked: pistillate spikes 1 or 2, short-stalked, short, with few large-turgid, tapering, shining perigynia and awl-like, rough-pointed scales. Probably Japanese.—Cult. for its stiff foliage. Grows 18–30 in. high. Allied to the N. Amer. *C. bullata*, Schk.



360. Carex lurida, one of the common bog species. (Natural size.)
a, staminate spike; *b*, *b*, pistillate spikes.

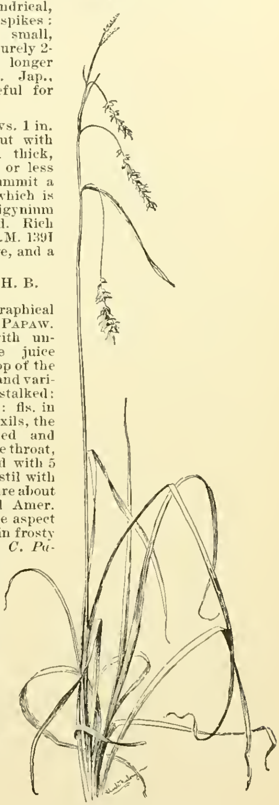
Gaudichaudiàna, Kunth (*C. vulgàris*, Fries, var. *Gaudichaudiàna*, Boott). Culms erect, 1–2 ft.: lvs. long and grass-like: staminate fls. in terminal spikes: pistillate fls. in 2–3 cylindrical, sessile or subsessile spikes: perigynium lenticular, small, very short beaked, obscurely 2-toothed, finely nerved, longer than the narrow scale. Jap., Austral., N. Zeal.—Useful for bog planting.

Fràseri, Andrews. Lvs. 1 in. or more broad, stiff, but with no midnerve, flat and thick, evergreen: culm 16 in. or less high, bearing at its summit a single whitish spike which is staminate at top: perigynium ovoid, thin and inflated. Rich mountain woods, Va. B.M. 1391 as *C. Fraseriana*.—Rare, and a very remarkable plant.

L. H. B.

CARÌCA (a geographical name). *Passifloràceæ*. Papaw. Small trees, mostly with unbranched trunks, the juice milky. Lvs. near the top of the trunk, alternate, large and variously lobed, soft, long-stalked: plant usually diœcious: fls. in racemes from the leaf-axils, the staminate funnel-shaped and bearing 10 anthers on the throat, the pistillate larger and with 5 distinct petals and 1 pistil with 5-rayed stigma. There are about 20 species, in tropical Amer. They have somewhat the aspect of palms. Under glass in frosty countries, the common *C. Papaya* is frequent, and is grown for its foliage and interesting habit (Fig. 363). In frostless countries, this species is grown for its fruit (Fig. 364), which is oblong or egg-shaped, a foot or so long, orange-yellow when ripe, thick-skinned, with many small black seeds. The young fruit is cooked and eaten, and the ripe fruit is eaten by natives.

L. H. B.



361. Carex longirostris (× ⅓).

The soil most suited for Caricas is a rich loam, having perfect drainage. As the stem is succulent and tender, great care is necessary to avoid bruising; hence pot-grown plants are much to be preferred to seedlings from the open ground. Seeds should be selected from the best and largest fruits and sown in a well-worked bed under a slight shade. If seeds are quite dry or old, they should be soaked in warm water before sowing. The seedling plants are delicate, and require close watching at first to avoid damping-off. Soon as plants are well up remove the shading, and after the third leaf appears they may be pricked out into a larger bed, or better, potted off in fairly rich soil. After plants are a few weeks old, and have been shifted once into larger pots, they may be set permanently outdoors in the tropics. Caricas seldom branch, but usually grow upright like a palm, hence cuttings are not often available. Sometimes small branches form, and these may be cut off and as readily rooted as most tropical decorative plants, provided the cutting is not too young and tender. In temperate climates, Caricas have been found to be good decorative plants for both conservatory and summer bedding, the deeply cut, palmate leaves forming a striking contrast to ordinary vegetation. In bedding out, select open, sunny exposure, with perfect drainage, and make the soil rich and friable. Constant cultivation with a light hoe will cause a luxuriant growth under these conditions, and the planter will be amply repaid for his trouble by beautiful, showy specimens as unique and tropical-appearing as palms.

Cult. by E. N. Reasoner.

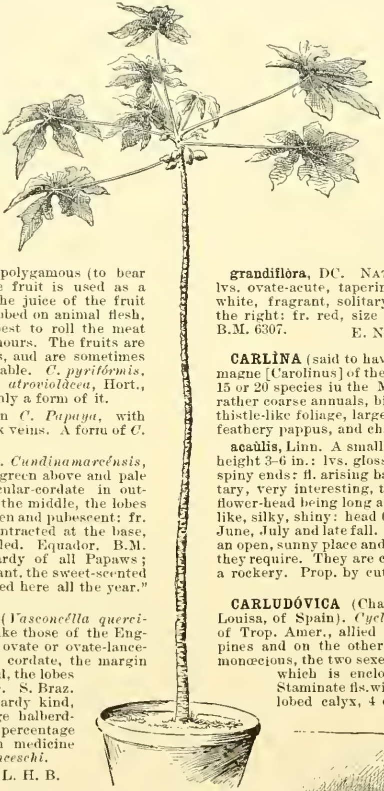
Papàya, Linn. Papaw. Melon Papaw. Melon Zapote. Figs. 363, 364. Trunk reaching 20 ft.: lvs. often 2 ft. across, palmately 7-lobed: fr. 6–12 in. long and half as thick, hanging from the lower axils of the pistillate plant. Trop. Amer., but widely naturalized. Grows spontaneously in the wild in S. Fla. B.M. 2898–9. A. G. 18: 137.—The plant seems sometimes to be polygamous (to bear both kinds of flowers). The fruit is used as a vermifuge and a cosmetic. The juice of the fruit or the macerated leaves, if rubbed on animal flesh, make it very tender. It is best to roll the meat and leaves together for a few hours. The fruits are made into sauces or conserves, and are sometimes eaten raw. The Papaw is variable. *C. pyrifórmis*, Hort., has pear-shaped fr. *C. atroviolàcea*, Hort., with purple fr., is evidently only a form of it.

grácilis, Hort. Larger than *C. Papaya*, with finely cut palmate lvs. with pink veins. A form of *C. Papaya?*

Candamarcénsis, Hook. f. (*C. Cundinamarcénsis*, Lindl.). Lvs. numerous, dark green above and pale beneath, pubescent below, circular-cordate in outline (1½ ft. across), 5-lobed to the middle, the lobes more or less pinnatifid: fls. green and pubescent: fr. small, obovoid and pointed, contracted at the base, 5-angled, golden yellow, 5-loculed. Equador. B.M. 6198.—"Probably the most hardy of all Papaws; makes rapidly a bold foliage plant, the sweet-scented yellowish flowers being produced here all the year." —*Franceschi, S. Calif.*

quercifòlia, Benth. & Hook. (*Vasconcélla quercifòlia*, St. Hil.). Lvs. shaped like those of the English oak, palmately 3-nerved, ovate or ovate-lanceolate and sometimes obscurely cordate, the margin undulate or inequally few-lobed, the lobes obtuse or the lower ones acute. S. Braz. and S.—"A quick-growing, hardy kind, with small fruits, but its large halberd-shaped leaves contain a higher percentage of papaine, now much used in medicine in preference to pepsin."—*Franceschi.*

L. H. B.


363. Carica Papaya.

CARÍSSA (aboriginal name). *Apocynàceæ*. About 20 very branchy spinose shrubs of the tropics of Africa, Asia and Australia, cult. for ornament or for the edible berry-like fr. Fls. white, solitary or in cymes; lobes of calyx and corolla 5, the 5 stamens free and included in the throat, the ovary 2-loculed: lvs. opposite and thick, simple. In the Old World sometimes cult. in warmhouses, but in this country known only in the extreme S. Prop. by seeds and cuttings of ripe wood.

Caràndas, Linn. Caraunda. Christ's-Thorn. Evergreen shrub or small tree, with dark green ovate or elliptic mucronate entire lvs., strong axillary spines (which are often forked) and fragrant white fls. in clusters of 2–3, the corolla twisted to the left in the bud: fr. the size of a cherry (1 in. in diam.), reddish, pleasant-tasted. India. L.B.C. 7: 663.—Reaches 20 ft. Half hardy in central Fla. The fruits are eaten from the hand when ripe, and pickled when green. Might serve for hedges.

Arduìna, Lam. Amatungula. Maritzgula. Spines strong, often 2 in. long: lvs. ovate and subcordate, mucronate, glabrous and entire: fls. white, the corolla twisted to the right in the bud. S. Afr.—A choice evergreen shrub, rather hardy, with thick camellia-like lvs., very glossy: fls. large, fragrant, white, and borne profusely: fr. dark red, 1–1½ in. long, resembling in flavor red raspberries, and having a papery skin and few small seeds. A fine pot shrub. Well worth extensive planting in S. Fla. and Calif. The fruit is said to be unsurpassed for jam making.

acuminàta, DC. Spines weak: lvs. smaller, ovate-acute, subcordate, mucronate: peduncles short, forked, axillary: fls. with lance-acuminate calyx lobes, the corolla twisted to the right in the bud. S. Africa.

grandiflòra, DC. Natal Plum. Spiny shrub: lvs. ovate-acute, tapering to the base: fls. large, white, fragrant, solitary and terminal, twisted to the right: fr. red, size of a cherry, good. S. Afr. B.M. 6307.

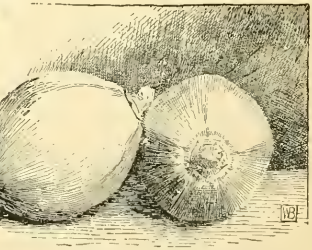
E. N. Reasoner and L. H. B.

CARLÌNA (said to have cured the army of Charlemagne [Carolinus] of the plague). *Compósitæ*. Some 15 or 20 species in the Mediterranean region. Low, rather coarse annuals, biennials or perennials, with thistle-like foliage, large white or purplish heads, a feathery pappus, and chaffy receptacle.

acaùlis, Linn. A small and very dwarf hardy plant: height 3–6 in.: lvs. glossy, pinnatifid, divided, with spiny ends: fl. arising barely above the foliage, solitary, very interesting, the scales surrounding the flower-head being long and narrow and ray- or petal-like, silky, shiny: head 6 in. across when expanded. June, July and late fall. G.C. II. 13: 720, 721.—Cult.: an open, sunny place and ordinary garden soil are all they require. They are capital for the sunny part of a rockery. Prop. by cuttings or seeds.

J. B. Keller.

CARLUDÓVICA (Charles IV., and his Queen Louisa, of Spain). *Cyclanthàceæ*. Palm-like plants of Trop. Amer., allied on the one hand to screw pines and on the other to aroids. The plants are monœcious, the two sexes being on the same spadix, which is enclosed in a 4-leaved spathe. Staminate fls. with many stamens and many-lobed calyx, 4 of them surrounding a pistillate fl.—the latter have a 4-sided ovary, 4 barren stamens, and 4-lobed calyx: fr. a 4-sided, many-seeded berry. The Carludovicas are usually regarded and treated as palms by gardeners. They are useful for decoration. The family Cyclanthaceæ is exclusively American, of



364. Carica Papaya (× 1-6).

35–40 species and 4 genera (Stelestylis, Carludovica, Ludovia, Cyclanthus); it is often united with the Pandaneceæ or screw pine family. L. H. B.

Carludovica palmata is the species most frequently met with under cultivation. Under favorable conditions it grows to a height of about 8 feet. All of the kinds need stove treatment during the winter months; in summer they may be used for subtropical bedding with good results. They have a certain palm-like appearance, but the leaves are of a softer texture than any of the palms. They may be propagated by division, choosing the early spring for the operation. *C. palmata* seeds freely. The fruit, when ripe, has an ornamental appearance for a short time after bursting open. The seeds are very small, and should be carefully washed free from the pulp, and sown on the surface of a pan of finely chopped sphagnum moss. Germination takes place in two weeks from sowing if kept in a brisk, moist heat. The species are not particular as to soil, but the drainage must be perfect, as the plants require an abundance of water when growing. G. W. Oliver.

365. Carludovica palmata.

A. *Lvs. 3–5-lobed.*

palmàta, Ruiz & Pav. Fig. 365. No trunk: petioles 3–6 ft. long, glabrous, terete and unarmed; blades 4-lobed, the lobes again cut into narrow segments, dark green, gracefully spreading, and drooping at the margin. Peru. R.H. 1861, p. 10.—The common species, and a very useful plant. Panama hats are made from this plant.

rotundifòlia, H. Wendl. Much like the last, but more compact under cult., owing to the shorter petioles, but growing much larger: petiole distinctly pubescent: leaf-blade large and orbicular, 3- or 4-lobed. Costa Rica. B.M. 7083.

élegans, Williams. Blades with 4 or 5 lobes, which are very deeply cut into straight strap-like divisions. Probably of horticultural origin.

AA. *Lvs. 2-lobed.*

atròvirens, H. Wendl. Blades very deeply 2-lobed and very deep, rich green (whence the name, *dark green*), glabrous. Colombia.

hùmilis, Poepp. & Endl. Dwarf: blades angular, 2-lobed at the summit, the segments more or less jagged but not divided, a foot or less broad. Colombia. R.H. 1869, p. 327.—One of the best.

Plùmerii, Kunth (*C. palmæfòlia*, Sweet). Caudex erect: blades with 2 lanceolate and plicate divisions, bright green above and pale beneath: spadices pendulous. Martinique.

imperiàlis, Lind. & André. Caudex short and prostrate: blades with 2 ovate-lanceolate entire segments, with very prominent veins, the lobes about 5 in. wide and shining green; petiole purplish, canaliculate, tumid at the base. Equador. I.H. 21:166 (by error 165).

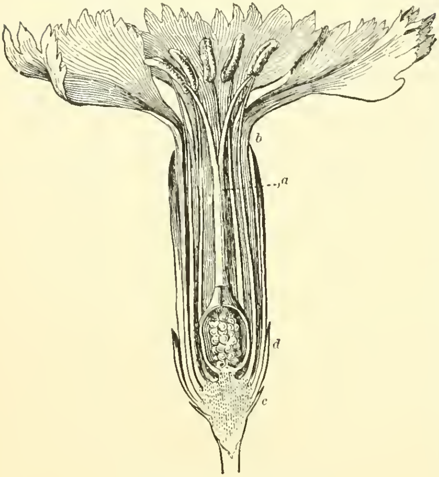
L. H. B.

CARNATION (*Diánthus Caryophýllus*, Linn.). *Caryophyllàceæ*. Figs. 366, 367. Half-hardy perennial, herbaceous, suffrutescent at base: height 2 ft.: stem branching, with tumid joints: lvs. linear, glaucous, opposite: fls. terminal, solitary; petals 5, flesh-colored, very broad, beardless margins toothed; calyx cylindrical, with scaly bracts at base. June–August. Native of southern Eu.; occasionally met in the wild state in England, where it was introduced through cultivation.

Theophrastus, who lived about 300 years B.C., gave the name Dianthus (Greek *Dios*, divine; *anthos*, flower) to the genus, probably suggested by the delightful fragrance. The specific name Caryophyllus (Greek, *Caryon*, nut; and *phyllon*, leaf) has been applied to the clove tree (*Caryophyllus aromaticus*), and because of the clove-like fragrance of the Carnation, this name was applied to the species; otherwise it would have no significance. The name Carnation (Latin, *carnatio*, from *caro*, *carnis*, flesh) has reference to the flesh-color of the flowers of the original type. This plant has been in cultivation more than 2,000 years, for Theophrastus (History of Plants, 300 B.C.) says: "The Greeks cultivate roses, gillyflowers, violets, narcissi, and iris," gillyflower being the old English name for the Carnation. It was not, however, until the beginning of the sixteenth century that the development of the Carnation into numerous varieties made an impression upon its history. The original flesh-color of its flowers was already broken up into its component colors, red and white. The gardeners of Italy, France, Germany, Holland and England, with their respective ideals of beauty in this flower, contributed so many varieties that in 1597 Gerard wrote that "to describe each new variety of carnation were to roll Sisyphus' stone or number the sands."

There were many attempts at classification, but most of them, like the varieties they serve, have disappeared. Two of them are as follows: The French scheme arranged all varieties into three classes, thus:—*Grenadins* (Fig. 368), including those with strong perfumes, flowers of medium size, either single or double, petals fringed, and of but one color; *Flamands*, including those with large flowers, round and double, rising in the center to form a convex surface, petals entire, either unicolored or striped with two or more colors; *Fancies*, including those with colors arranged in bands on light grounds, the petals toothed or not. The English classification of these varieties makes four categories: *Selfs*, or those possessing only one color in the petals; *Flakes*, or those having a pure ground of white or yellow and flaked or striped with one color, as scarlet, purple or rose; *Bizarres*, or those having a pure ground marked as in the *Flakes*, but with two or three colors; and *Picotees*, or those having a pure ground of white or yellow, and each petal bordered with a band of color at the margin. This last class has been regarded with the distinction of a race.

In the early part of the nineteenth century English gardeners exercised very great care, in the growing of Carnations, to mature only perfect flowers. Imperfect and superfluous petals were extracted with forceps; petals appearing out of place were arranged in a perfect imbrication ; the calyx tube was cut partly down between the teeth, to prevent excessive splitting at one side and to give more freedom to the expansion of the flower. These and many more tedious details seem to have wrought the downfall of this sweet flower about the middle of the nineteenth century.

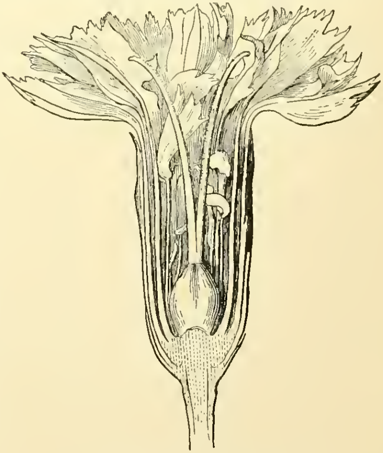


366. Section of Carnation flower.
c, *d*, bracts; *b*, calyx; *a*, style.

All the foregoing has reference to those types of Carnations which are but little known or grown in America at the present day. The varieties so common in Europe are usually kept in coldframes or coolhouses during the winter, and as spring approaches the plants are brought into their blooming quarters, for no flower is expected to appear until the month of July, when there is a great profusion of blossoms, but for a short season. Therefore, they can all be classed as a summer *race*. They are also grown permanently in the open.

Perpetual-flowering Carnation (Remontant, Monthly, or Tree).—The Carnations so common in America, and grown so extensively under glass for winter cut-flowers, originated about 1840 as a distinct race of Perpetual-flowering Carnations. A French gardener, M. Dalmais, according to M. Jean Sisley, of Lyons, obtained the first real constant-blooming Carnation, which was called Atim, and sent out in 1844. It was the result of artificially crossing Oeillet de Mahon, or St. Martin, because it was regularly bloomed in November, with pollen from Oeillet Biohon. The first gain was crossed with Flemish Carnation with repetition. In 1846 he obtained a great number of varieties of all colors. M. Schmitt, a distinguished horticulturist of Lyons, followed in the work, and obtained several fine varieties, like *Arc-en-ciel* and *Etoile Polaire*, which were cultivated for several years. The next enthusiast who aided materially in the development of this new race of Carnations was M. Alphonse Alegatiere, who, by careful crossing, obtained varieties with stiff stems. About 1866 the number of such varieties was increased, and as a class they received the name of *Tree Carnations*, but in America they were more generally termed the Monthly Carnations. The earliest importation of this race of varieties into America seems to have been made in 1868, and included such varieties as Edwardsii, President Degraw, La Purite and Variegated La Purite, and for a period of ten years were grown as pot plants for summer or winter blooming. About 1875 bench culture was introduced in coolhouses, and was attended with such marked success that soon entire greenhouses were devoted to the cultivation of the Carnation, and there arose the carnation specialist, or carnationist, the latter title being used first, in 1892, with such men as Starr, Swayne, Tailby and Dorner. There are now about 500 distinct varieties in this country, all of American origin. The winter forcing of Carnations is now more highly developed in America than anywhere else in the world. For sketches of the evolution of the Carnation, particularly of the American cut-flower race, see Bailey, "Survival of the Unlike."

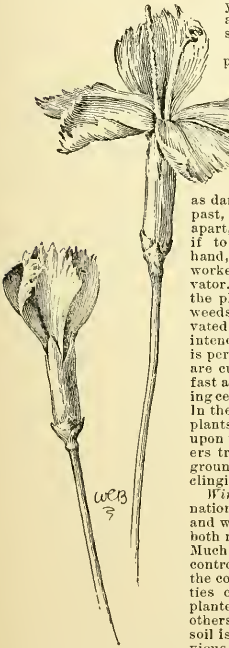
Propagation.—The perpetual-flowering Carnations are propagated by cuttings (Fig. 369). The best "wood" for this purpose is found in the lateral shoots at the base of thrifty branches ; shoots appearing high on the flowering stem are not desirable. No cuttings should be taken from stems bearing small, sickly, or poorly colored flowers. Diseased plants, and plants which have been greatly stimulated and forced in a high temperature, should also be avoided in propagation. The material for cuttings is pulled from the plants by a lateral movement, and in this condition,—that is, without further cutting or trimming,—is considered by many propagators as ready for the sand-bench ; others remove a portion of the leaves or the tips of the long ones. Cuttings are successfully made from December 1 to May 1. Growers choose different portions of this period for the best results. February is, perhaps, most frequently chosen. The cuttings are usually planted in sand-benches to be rooted, either in a separate propagating house or upon a portion of bench prepared for the purpose in the regular Carnation house. For a limited number of cuttings, "flats" may be used and placed where they will receive proper treatment. The temperature in which cuttings are best rooted is 50° F. for the first few days, then increased to 55° or 60° F. During sunshine the young cuttings are shaded, and at all times moisture is carefully regulated, to avoid the "damping off" fungus and the flagging of the cuttings. In about four weeks a good bunch of roots will be formed, and the cuttings are transplanted into small pots or flats. They are then kept in coolhouses (45 to 50° F.) until it is possible to plant them in the field. Propagation by layering is practiced abroad (Fig. 370), but is too slow for American conditions. Plants are grown from seed only when it is desired to obtain new varieties.



367. Showing the anthers becoming leaves,—a stage in the doubling of the Carnation.

Summer Treatment.—The young plants are carefully hardened in the spring, to enable them to be planted in the open field in May. Various soils have given good results. A sandy soil yields fine plants if a drought does not prevail; a clay soil will make short, stiff plants, which are slow to yield flowers in the fall; a sandy loam is the best soil.

The field soil is well prepared by applying a liberal quantity of well-rotted manure or an equivalent in commercial fertilizer, plowing deeply and harrowing thoroughly. The plants are then set, as soon as danger from heavy frosts is past, putting them 10 inches apart, in rows 12 inches apart if to be worked entirely by hand, and 3 feet apart if to be worked with horse and cultivator. Throughout the summer the plants are kept free from weeds and frequently cultivated. No blossoming by plants intended for winter flowering is permitted. All rising shoots are cut back to 2–4 inches as fast as they appear. Such pruning ceases about August 1 to 10. In the month of September the plants are lifted and planted upon the benches. Some growers transplant with "balls" of ground, others without any soil clinging to the roots.



368. Grenadin Carnation. (× ⅔.)

Winter Treatment.—The Carnation house usually stands east and west, and is provided with both raised and solid benches. Much experience and a long controversy have resulted in the conclusion that some varieties of Carnations should be planted on raised benches and others on solid benches. The soil is prepared some time previous to its use, with three-fourths loam and one-fourth well-rotted manure, turning several times to thoroughly mix the elements. About September 1 it is placed on the benches, enough to be 4 or 5 inches deep when settled. The plants are set 8 to 12 inches apart each way, watered thoroughly, and syringed frequently until established. Staking is necessary to keep the branches off the ground and the flowers above the foliage. Various arrangements of wires and strings are devised. The use of plant-stakes has been universally abandoned.

The temperature of the Carnation house is maintained at 50 to 55° F. at night and about 10° warmer in the daytime, during the whole winter. The proper use of water maintains a healthy growth, ensures substantial flowers, and prevents red spider. On bright days the houses are freely syringed. Fertilizers are used with great liberality on the plants in the benches, and with good results. Liquid manures from horse, cow, sheep or hen droppings, diluted to the color of weak tea, are applied about once a week, beginning about January 1, or a mulch of well-rotted cow manure is put over the ground after the plants become well set. Disbudding is practiced to produce large flowers on stiff stems.

369. Carnation cutting.

Carnations are not very seriously annoyed by insects or fungous diseases. The red spider is usually kept under control by syringing judiciously with water, and the greenfly by fumigation with rose-leaf extract or the use of tobacco stems on the floor of the house. Three fungous diseases have recently become annoying; viz., rust (*Uromyces caryophyllinus*, Schr.), anthracnose (*Volutella* sp.), and spot or blight (*Septoria Dianthi*, Desm). The best treatment is to destroy diseased plants and to spray the rest with Bordeaux mixture.

Varieties are constantly changing. The following represent the common range of variation:

White—Lizzie McGowan (Fig. 372), Ivory, Alaska, Uncle John, Flora Hill, White Cloud.

Pink—Wm. Scott, Daybreak (Fig. 374), Albertini, Bridesmaid, Della Fox, Triumph, Victor.

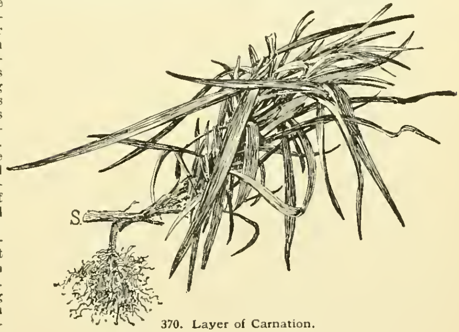
Scarlet—Hector, Portia, Dazzle, Jubilee (Fig. 373).

Variegated—Minnie Cook, Helen Keller, Mrs. Geo. M. Bradt, Armazindy.

Yellow—Eldorado, Buttercup, Mayor Pingree, Gold Nugget.

Crimson—Meteor, Tidal Wave, Cartledge.

Carnations in Pots.—For pot culture, the Carnation is propagated and treated as previously described in field culture up to the time of lifting the plants, when they are taken up and planted singly in pots,—4-, 5-, 6-, or 7-inch sizes, suiting them to the size of the plants. If the heading-back was not continued too late in the field, many plants may be in bud in October and be excellent specimens for fall sales. The bulk of the potted plants, however, are intended for spring sales, and are carried over the winter in well-built coldframes, left uncovered as long as fine weather will permit; frosts and even light freezes will not hurt the plants. At the approach of severe weather, sashes are covered over the plants, but on mild days liberal ventilation is given, and during extreme winter cold additional covering is placed over the frames. About the first of March these plants are brought into a coolhouse, and one month later they are graced with a profusion of buds and blossoms; with proper care they will continue to flower throughout the summer. The varieties preferred for pots are those of dwarf habit, with stems stiff enough to hold up the flowers without staking. In color, the varieties known as "fancies" are usually more salable than those with single colors. Varieties recommended for pot culture are Portia, Mrs. Fisher, Grace Wilder, Buttercup, American Flag, Robert Craig, E. G. Hill.



370. Layer of Carnation. The parent stem was severed at S.

Other Carnations.—Aside from the forcing Carnations, the following groups receive attention in this country:

Carnation, Malmaison.—This is a group of varieties grown in Europe. It is said (Revue Horticole, 1888) that the original variety of the group was taken from La Malmaison in the time of Napoleon I. It was pure white in color, but now all the shades of red are in the group. The flowers are very large, even 6 inches in diameter with good culture. The plants are dwarf, very floriferons, but not constant bloomers, never seeding. The stems are strong and straight. Usually propagated by cuttings or layers.

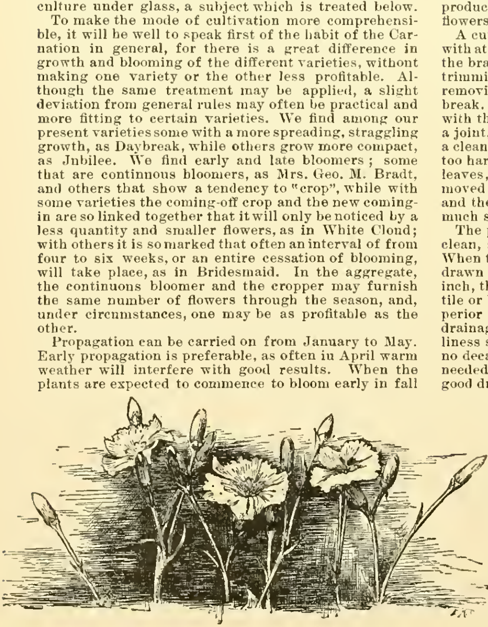
Carnation, Victoria.—A group of varieties under this name originated with M. Benary, Erfurt, Germany, in 1879 (Revue Horticole. 1890), probably descendants from Souvenir de la Malmaison, which it closely resembles, but of greater merit because of a firmer calyx. All the colors of Carnations are represented; petals are large, finely fringed. The plant is dwarf, not remontant. Propagated by layers or cuttings. The members of this group, as of the preceding, have not received much attention in this country.

Carnation, Marguerite (Fig. 371).—A comparatively new class of Carnations. Origin not definitely known; supposed to have been in somewhat obscure cultivation in Italy and Algeria a very long time. The plants are generally raised from seed, and blossom in about four months. A very large majority of flowers come double or semi-double, strongly clove-scented, deeply fringed; color red, pink or white. The plant is dwarf, 10–15 inches high, compact, erect, branching. It is a constant bloomer, but in quality the flowers are far inferior to the Perpetual-flowering Carnation. The Marguerite Carnations are highly prized for massing in summer beds, and are treated as annuals. GEORGE C. BUTZ.

COMMERCIAL CARNATION CULTURE.—Carnation culture can be divided into three parts or periods—propagation of the young plants during the winter and early spring months; the summer culture, generally carried on in the field or garden, for the growing of the young plants to a stage of maturity suitable for the transfer to the houses in the fall; and the winter or house culture, which is often prolonged through spring and early summer, depending on the condition of plants and variety. Of late, experiments have been made with summer culture under glass, a subject which is treated below.

To make the mode of cultivation more comprehensible, it will be well to speak first of the habit of the Carnation in general, for there is a great difference in growth and blooming of the different varieties, without making one variety or the other less profitable. Although the same treatment may be applied, a slight deviation from general rules may often be practical and more fitting to certain varieties. We find among our present varieties some with a more spreading, straggling growth, as Daybreak, while others grow more compact, as Jubilee. We find early and late bloomers; some that are continuous bloomers, as Mrs. Geo. M. Bradt, and others that show a tendency to "crop", while with some varieties the coming-off crop and the new coming-in are so linked together that it will only be noticed by a less quantity and smaller flowers, as in White Cloud; with others it is so marked that often an interval of from four to six weeks, or an entire cessation of blooming, will take place, as in Bridesmaid. In the aggregate, the continuous bloomer and the cropper may furnish the same number of flowers through the season, and, under circumstances, one may be as profitable as the other.

Propagation can be carried on from January to May. Early propagation is preferable, as often in April warm weather will interfere with good results. When the plants are expected to commence to bloom early in fall and furnish a good quality of blooms, early propagation is a necessity. Late-blooming varieties, when propagated early, advance their time for blooming considerably. Late-propagated plants may have to be transferred from the propagating bed to the field at a time when the hot weather will prove very severe on the little plants; they are deprived of the advancing spring growth, and consequently make little headway through the hot summer months, but will make good plants for late blooming, or, when not allowed to bloom, will furnish excellent cuttings for early propagation.



371. One form of the Marguerite Carnation (× ⅓).

Any young shoots not advanced into bud formation, but seeming to be capable of producing a good flower in time, will, as a cutting, make a good plant. If the bud has commenced to form, even only to half the size of a pinhead, it is bound to develop; it retards root formation, and when eventually roots are formed, all the nourishment taken up is used to mature that bud. Such cuttings, doubtful at their taking, but which will in time develop a flower-bud, are not to be necessarily classed as bad cuttings if, at the first symptoms, the bud is removed; when left to develop it may still make a plant after a lapse of two or three months, but time is lost. In general, the strongest and best cuttings are found at the base of the flower-stem; those that appear upon the flower stem are of an inferior quality, and will in time show symptoms of degeneration; the same will be the case when taken from exhausted blooming plants. For this reason the late-propagated plants, whose growth has been made through the late fall months, and where the flower stems are removed as fast as they appear, and the whole strength thrown into the young shoots appearing below the break, will furnish the best cuttings. The plant is in quite a different stage of growth when producing new shoots, and when young shoots—cuttings—are produced only in connection with the maturing of flowers. This will lead to the conclusion that to produce the best cuttings, a separation of the culture for flowers and the culture for cuttings is the best solution.

A cutting should have an average length of 4 inches, with at least 1-inch clean stem. When taken off close from the branch or stem out of the axil of a leaf, no further trimming of the heel is necessary except an occasional removing of some wood fibers that may adhere from the break. When the shoot is too long and demands a cut with the knife, the cut should be made at or right above a joint, so that the two leaves can be peeled off and leave a clean heel. If cut too high above a joint, the stem gets too hard; if below, the bark will be peeled off with the leaves, and gives occasion to rot. Leaves should be removed as far as the cutting is inserted in the sand, and the top of the leaves shortened, so as not to give too much surface to evaporation.

The propagating bed should be filled with 3 inches of clean, sharp sand, not too coarse, and well packed. When the cuttings are to be inserted, a line should be drawn with a knife to the required depth of about 1 inch, the cutting inserted and the sand pressed on. A tile or brick bottom in the propagating bed is much superior to a common wooden bottom; it assures better drainage and less danger of fungus. The utmost cleanliness should be observed in a propagating house, and no decaying matter be allowed to lie around. Water is needed every two or three days when the bench has good drainage. The house should be shaded either from the outside with a whitewash of white lead and coal oil, or on the inside with a light white muslin. Ventilation is advisable whenever the temperature comes near to 60°; general temperature 55°, and all available means should be employed to keep it at that point. Day temperature may be two or three degrees above, and night temperature as much below.

Average time to root Carnation cuttings is four weeks, and depends much on the variety. Mary Wood may root in two weeks, while it may take six weeks to root Mrs. Geo. M. Bradt. In a higher temperature, cuttings will root more quickly, but it is not advisable, as it increases the danger of cutting-bench fungus and softens the young plants.

As soon as rooted, transplant into a light soil enriched with well decomposed manure—none other should be used—in a light, well-ventilated house, either on benches, in flats or small pots, the latter preferable, as early-rooted plants can be shifted into larger pots, and the later-rooted be just in good shape for the transfer to the field. Temperature the same as in the propagating house, but when the young plants become well established may be kept 5° lower.

372. Carnation, Lizzie McGowan.

373. Carnation, Jubilee.

374. Carnation, Daybreak.

The ground for the field or summer culture should be well prepared, and any working in it be avoided when too wet: planting to be done as soon as the weather will permit. A good spring growth is of the greatest advantage, especially if good plants are wanted for early fall blooming. Late spring frosts will not injure the plants, and a cool atmosphere is more congenial to a good growth than the hot summer weather, when growth is comparatively slow; plants to stand at least 15–18 inches apart each way, or at any greater distance, as the mode of cultivating the soil to be adopted may require. From the time of planting, as soon as a crust forms after a rain it should be broken and the surface of the soil kept in a mellow condition to a depth of 2 inches throughout the summer; any deeper cultivating is injurious rather than beneficial to the plants. A thorough cultivating will not only destroy weeds, but will keep the soil in condition in which it retains moisture the longest, and will carry the plants much better through a drought than when resort is had to watering. Watering, unless it can be done thoroughly and kept up, should not be resorted to, and only as a last measure in a severe drought.

When the plants attain the height of 5–6 inches, topping should be commenced and be kept up as long as the plants remain in the field. This operation is for the purpose of removing the top shoots where buds are forming, or where a part of the plant grows out of proportion to the other, to force the plant to grow into a symmetrical, bushy form. At the same time, care must be taken not to cut any more than the purpose of topping calls for, for the plant is just as dependent on all its leaves as on its roots. Any bloom is at the expense of the fall and winter crop, for it retards the growth of the plant and uses up energy that is wanted at a more desired time.

The transfer from the field to the house for the following winter culture is an ordeal to the plants and much anxiety to the grower. If early flowers are wanted, an early transfer has to be made—as early as the latter part of August and beginning of September. Late-rooted plants, that had not the chance of any spring growth, should be given the benefit of a fall growth and be transferred later.

The preparation of the soil for the benches in the houses should be commenced the year before. If possible, select a piece of sod—but other ground will answer—give it a good coat of stable manure and plow under. In the spring, add more manure or any fertilizer that the soil may mostly require, especially bone, wood-ashes and lime, if not already in the soil, plow again, and repeat the plowing two or three times during the summer. As to the texture of the soil, a loam that contains some clay without making it too heavy, is preferable. It requires a rich soil and, therefore, the preparation has to be commenced in time, so that the manures become decomposed and well incorporated, ready for assimilation.

375. Carnation, Little Gem. A striped flower.

Light, roomy houses, with good ventilation, are required to insure a bountiful crop. Whether solid or raised benches, especially for the latter, fresh soil is required every season. Good drainage and an even filling and packing of the soil insures an even, healthy growth. Strong-growing varieties should be planted 12–15 inches each way, less strong ones closer; any crowding, when not diminishing the quantity of flowers to the square foot, will certainly degrade the quality of the same. Transplanting is an ordeal for the plants, and has to be done with the greatest care and dispatch, especially as the ordeal is often aggravated by hot weather during early transplanting. Points to be observed are, in the first place, a careful lifting. When the ground is sandy and loose, the ground may be shaken off, but when hard and baked, so there is danger of breaking the roots, it is better to leave a ball. In setting, plants should be cleaned of all decaying leaves, and buds removed. Place the plants in a natural position by spreading the roots out over a little mound formed in the excavation made for the plant, and press the ground on firmly. Any deeper planting than the plants have stood in the fields invites stem-rot. Water well after transplanting, after that more sparingly, as a too wet, cloggy soil will retard root-formation. Other precautions to facilitate the establishing of the plants are shading of the house, and reduction of ventilation to a minimum. A moist, cool air, even if close, that otherwise would be injurious, has to be employed to prevent a too strong enervating evaporation from the leaves—in other words, to prevent wilting. An occasional syringing two or three times a day will give enough moisture to the soil after the first watering, and keeps a moist atmosphere. When plants showing signs of having formed new roots become established, any of the precautions employed to gain this end become injurious. The shading is to be gradually removed, ventilation increased, syringing reduced, and a normal treatment of growing plants assumed. House culture may be summed up as follows: Average night temperature 55°, day temperature on cloudy days 60° to 65°. When over 60°, ventilation should be given, and increased when necessary to retain the desired point. Fresh air is a necessity, and ventilators should be opened whenever it is practicable to do so. All syringing is to be avoided and the water applied to the soil below the plants. Water should be given freely when needed, and care be taken to make the watering thorough, reaching the bottom of the bench. Glass roof should be kept clean, so the plants will derive the benefit of every moment's sunshine. Cultivating the soil, with the exception of a mere scratching, is of more injury than benefit, as it will destroy the white roots coming near the surface in quest of food.

The principles of support are to hold the body of the plant off from the soil for a free circulation of air underneath, and to support the flower stems in a way so as not to impair the plant in its freedom of growth, and leave free access to cut the blooms with any desired length of stem.

The Carnation is rather a heavy feeder, and quantity and quality of blooms depend largely on the nourishment supplied. The necessity for feeding depends on the richness of the soil, and to avoid a disastrous overfeeding, food has to be applied judiciously—rather weak and often than too strong at a time. Feeding can be done with a mulch of well decomposed manure, or best, with prepared liquid manure. If it can be arranged so a part of the liquid manure could be given with each or every other watering, best results will follow and danger of overfeeding be avoided. In the preparation of liquid manure, it is best to take fresh cow-manure as a base and add any other ingredients desirable, as chicken manure, bone meal, sulfate of potash; but avoid anything that contains lime, as lime will set free the valuable ammonia.

Summer culture under glass has been experimented with in late years, but with no generally satisfactory results. The hot, close, greenhouse air is against it; the plants grow, as greenhouse plants do, soft and drawn, not to be compared with the sturdy, short-jointed, hardier outdoor growth, so productive of a good crop. Indoor-grown plants lack the foundation gained in the field. True, the plants will not have the set-back of a transplanting, but better results have to be shown before this mode of summer culture will become general.

Every year new varieties are produced and introduced, superseding older ones. A list of the varieties grown at present may be useless in three or four years, so we mention only the best grown now. Among the whites, Lizzie McGowan (Fig. 372) has been a standby, but White Cloud now stands as the best. Maceo is the best deep red or maroon yet produced; a very free and continuous bloomer. In the scarlets, Jubilee (Fig. 373) wants first place, but indications are that it will be superseded

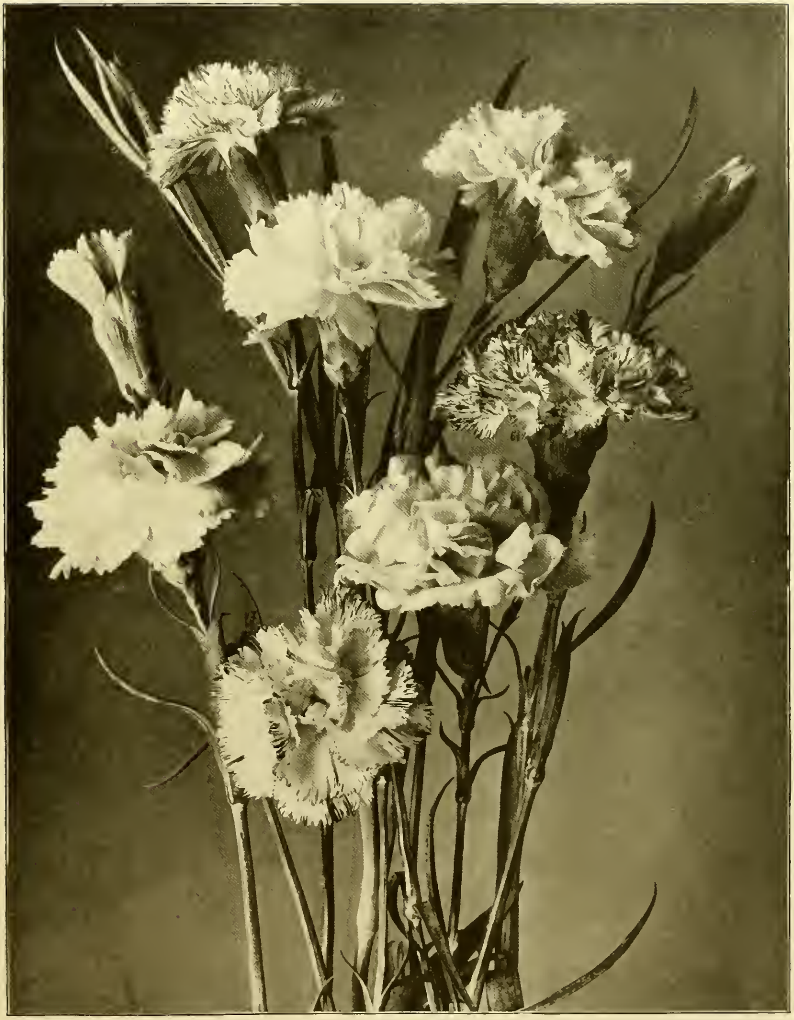


Plate IV. Carnations
Types of the American winter-flowering Carnation. Half size

by G. H. Crane. Among the light pinks, Daybreak (Fig. 374) is still a standby, but there are some among the new ones that will, to all appearance, push it into the background. In the dark pinks, Scott yet claims the honors, but Mrs. Francis Joost, as the newer variety, may succeed to its place. In yellow, Gold Nugget is conceded the best. Mayor Pingree is a good large flower, but rather of a pale color, and a shy bloomer. The Carnation par excellence is Mrs. Geo. M. Bradt, white striped scarlet—an even, continuous bloomer throughout the whole season; a fine, large flower, admired wherever grown.

Fred Dorner.

CAROB. See *Ceratonia.*

CAROLINA ALLSPICE. See *Calycanthus.*

CARPEL. One of the separable or component parts of a compound pistil. See *Flower.*

CARPENTÈRIA (after Professor Carpenter, of Louisiana). *Saxifragàceæ.* Evergreen shrub, with rather large opposite lvs.: fls. large, in terminal, loose corymbs; calyx 5-parted; petals 5; stamens numerous; ovary almost superior, 5–6-celled: fr. a many-seeded dehiscent capsule. One species in Calif. A highly ornamental evergreen shrub, with very large, white and fragrant fls., but not hardy north. It requires a well-drained, light and sandy soil, and sunny, somewhat sheltered position; it especially dislikes moisture during the winter, and its perishing is often more due to an excess of moisture than to the cold. Prop. by greenwood cuttings under glass in summer, and by suckers, which it produces freely; also, by seeds, sown in spring.

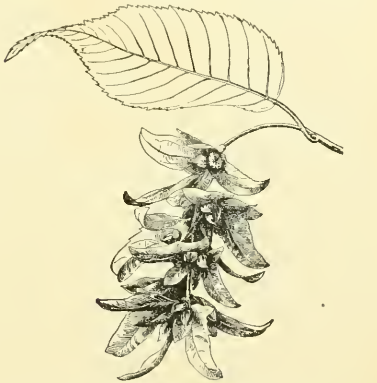
Califórnica, Torr. Shrub, 6–10 ft.: lvs. elliptic-lanceolate, entire or remotely denticulate, bright green above, whitish-tomentose beneath, 2–4 in. long: fls. pure white, 2½–3 in. in diam., fragrant; petals orbicular, concave. June, July. B.M. 6911. Gn. 31:581, and 54, p. 248. G.C. II, 26:113. R.H. 1884, p. 365. J.H. III, 29:251.

Alfred Rehder.

CARPET BEDDING. See *Bedding.*

CARPÌNUS (ancient Latin name). *Cupuliferæ* (or *Betulàceæ*). Hornbeam. Tree, of medium size, sometimes shrubby: lvs. deciduous, petioled, alternate, serrate; stipules deciduous: fls. in catkins, appearing with the lvs.; staminate catkins pendulous, each scale bearing 3–13 stamens, 2-forked at the apex; pistillate catkins terminal, slender, each scale bearing two ovaries, the bracts and bractlets of which develop into a large, leafy, more or less 3-lobed bract, embracing the small, nut-like fruit at the base. About 8 species in C. and E. Asia, 2 in Europe and W. Asia and 1 in N. and C. Amer. Hardy, ornamental tree, usually with dense, round head, and of somewhat slow growth. The wood is very hard and close-grained, and much used in making tools and other small articles. The handsome foliage is rarely attacked by insects, and assumes a yellow or scarlet color in fall. The most beautiful are *C. cordata*, with large lvs., and *C. Japonica*, of graceful habit and with elegant foliage. The Hornbeam bears severe pruning well, and is very valuable for high hedges, and the European species was formerly much used in the old formal gardens for this purpose; the latter makes, also, an excellent game cover, as it retains its withered foliage almost throughout the whole winter. They grow in almost any soil, and even in dry, rocky situations. Prop. by seeds, sown usually in fall, germinating very irregularly; if they do not spring up the first spring, the seed bed should be covered until the following spring with moss or leaf-mold, to keep the soil moist. If intended for hedges, the seedlings should be transplanted after the first year, and allowed sufficient space to prevent them from growing into slender, tall plants, unfit for hedges. The varieties of rarer species are grafted in spring under glass, or in the open air on seedlings of one of the common species.

Caroliniàna, Walt. (*C. Americàna,* Michx.). American Hornbeam. Blue Beech. Fig. 376. Bushy tree, rarely 40 ft.: lvs. ovate-oblong, usually rounded at the base, acuminate, sharply and doubly serrate, glabrous at length, except in the axils of the veins beneath, 2–4 in. long: fruit-clusters peduncled, 2–4 in. long: bracts ovate or ovate-lanceolate, ¾–1 in. long, with 2 broad and short inequal lateral lobes, and a much longer middle lobe, usually serrate only on one margin. E.N. America, west to Minnesota and Texas; also, in Mexico and C. Amer. S. S. 9:447. Em. 1:199.—Bushy tree, with dense, but slender and often somewhat pendulous branches, and dark bluish green foliage, changing to scarlet or orange-yellow in fall.



376. Carpinus Caroliniana (× ½).

Bétulus, Linn. European Hornbeam. Tree, to 60 or 70 ft.: lvs. similar to those of the former, cordate or rounded at the base, ovate or oblong-ovate, of somewhat thicker texture, and the veins more impressed above: fruit-clusters 3–5 in. long; bracts over 1½ in. long, with ovate, lateral lobes, and much longer oblong-lanceolate middle lobe, the margins almost entire or remotely denticulate. Europe to Persia.—The most remarkable of the garden forms are the following: Var. **incìsa,** Ait. (var. *quercifòlia,* Desf.). Lvs. incised or lobed, smaller. Var. **fastigiàta,** Hort. Of upright growth. Var. **purpùrea,** Hort. Lvs. purplish when young, green at length. It grows into a taller tree than the American species, though the former is of more vigorous growth when young; the foliage turns yellow in fall, and remains on the tree throughout the winter.

C. Americàna, Michx.=C. Caroliniana.—*C. cordàta,* Blme. To 40 ft.: lvs. deeply cordate, ovate or oblong-ovate, with 14–20 pairs of veins, 4–7 in. long. Japan, Manchuria. G. F. 8:295. The most beautiful species, and quite hardy.—*C. duinénsis,* Scop.=C. orientalis.—*C. Japónica,* Blme. To 50 ft.: lvs. slightly cordate or rounded, oblong-ovate, 3–4 in. long, with about 20 or more pairs of veins. Japan. G.F. 6:365 (as Carpinus Carpinus). R.H. 1895:427. A very graceful species.—*C laxiflòra,* Blme. To 50 ft.: lvs. ovate or elliptic-ovate, long acuminate, 2–3 in. long, with 10–14 pairs of veins. Japan. Very attractive in fall, with its long and slender catkins.—*C. orientàlis,* Mill. Bushy tree, to 15 ft.: lvs. ovate or oblong-ovate, 1½–2 in. long, with about 10 pairs of veins. S. E. Europe to Persia.—*C. Turczaninòwi,* Hance. Shrubby tree: lvs. ovate, acute, 1–2 in. long, with 10–12 pairs of veins. N. China.—*C. Virginiàna,* Michx. f.=C. Caroliniana.—*C. Yedoénsis,* Maxim. Small tree: branchlets and lvs. beneath pubescent; lvs. ovate-elliptic or ovate-lanceolate, with about 12 pairs of veins, 2–3 in. long. Japan.

Alfred Rehder.

CARRIÈRIA (after E. A. Carrière, prominent French horticulturist and botanist, died 1896). *Bixàceæ.* Deciduous trees, with alternate, long-petioled, glabrous lvs., resembling in appearance the genus Idesia. Two species, recently discovered in China, of which one, **C. calycìna,** Franch., has been introduced. It is a tree to 50 ft. high, with rather large, oval or obovate lvs. and apetalous fls. with 5 large sepals in few-fld. terminal racemes. It will be probably of the same hardiness and culture as Idesia. R. H. 1896, p. 498.

Alfred Rehder.

CARROT (*Daùcus Caròta*, Linn.). *Umbelliferæ.* A native of the British Isles, and one of the bad introduced weeds of eastern North America (Fig. 377). The improved succulent-rooted garden varieties are believed to be descended from the same stock, though this has been denied. It seems probable that the horticultural improvement of the species was begun in Holland, and it is said that the cultivated forms were introduced thence into the gardens of England during the reign of Queen Elizabeth. The Carrot is now very generally, though not extensively, cultivated everywhere, both for culinary purposes and for stock-feeding. It is sometimes forced under glass, but to no great extent. Carrots are most useful in culinary practice for soups, stews, and salads, and as this class of cookery has never been reasonably popular in America, this vegetable has not received the attention it deserves.

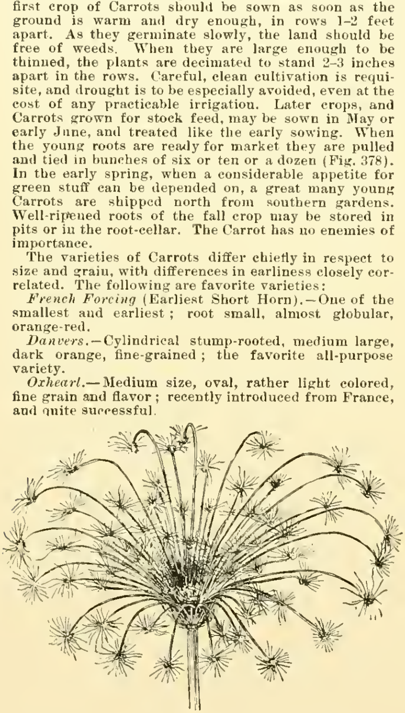
The Carrot requires a loose, friable, warm soil, in the very best mechanical condition, and especially for the early crop of tender spring roots, this needs to be liberally fertilized with well-rotted stable manure and some rapidly available potash fertilizer. Seed for the first crop of Carrots should be sown as soon as the ground is warm and dry enough, in rows 1–2 feet apart. As they germinate slowly, the land should be free of weeds. When they are large enough to be thinned, the plants are decimated to stand 2–3 inches apart in the rows. Careful, clean cultivation is requisite, and drought is to be especially avoided, even at the cost of any practicable irrigation. Later crops, and Carrots grown for stock feed, may be sown in May or early June, and treated like the early sowing. When the young roots are ready for market they are pulled and tied in bunches of six or ten or a dozen (Fig. 378). In the early spring, when a considerable appetite for green stuff can be depended on, a great many young Carrots are shipped north from southern gardens. Well-ripened roots of the fall crop may be stored in pits or in the root-cellar. The Carrot has no enemies of importance.

The varieties of Carrots differ chiefly in respect to size and grain, with differences in earliness closely correlated. The following are favorite varieties:

French Forcing (Earliest Short Horn).—One of the smallest and earliest; root small, almost globular, orange-red.

Danvers.—Cylindrical stump-rooted, medium large, dark orange, fine-grained; the favorite all-purpose variety.

Oxheart.—Medium size, oval, rather light colored, fine grain and flavor; recently introduced from France, and quite successful.



377. Last year's umbel of wild Carrot.

Half-long Scarlet.—Top small, roots medium size, cylindrical pointed; much used for bunching.

Early Scarlet Horn.—Top small, roots half-long, somewhat oval, smooth, fine grain and flavor; a favorite garden sort.

Large White Belgian.—Very large and rather coarse, whitish; principally grown for stock-feeding.

F. A. Waugh.

CÀRTHAMUS (Arabic name, alluding to the color). *Compósitæ.* Hardy annuals 2–3 ft. high, with spiny lvs. Involucre with spreading and leafy outer scales and the inner ones more or less spiny: receptacle chaffy: akenes glabrous, mostly 4-ribbed, the pappus none or scale-like. Of easiest culture, from seed.

378. A bunch of Carrots.

tinctòrius, Linn. Safflower. False Saffron. One to 3 ft. high, glabrous, branched: lvs. ovate, spiny-toothed: fl.-heads with upward-tapering involucre, and a globular crown of orange florets. Asia.—The flowers furnish a dye material, which is used in place of the true Saffron (which is a Crocus). L. H. B.

CÀRUM (Caria, in Asia Minor). *Umbellíferæ.* Glabrous annual or perennial herbs, widely distributed in temperate and subtropical regions. Lvs. pinnate, or ternate and pinnately decompound: fls. white or yellowish, small, in compound umbels, the calyx-teeth small: fruit ovate or oblong, sometimes compressed, more or less ribbed, glabrous, or sometimes hispid. Roots often tuberous. Fifty or more species.

Cárui, Linn. Caraway (which see). Stem slender but erect, furrowed, 1–2 ft.: lvs. pinnately decompound, with thread-like divisions. Old World.—Sometimes runs wild.

Petroselìnum, Benth. & Hook. f. (*Petroselìnum satìvum*, Hoffm.). Parsley (which see). Erect, 1–3 ft.: lvs. ternate-pinnate, the lfts. ovate and 3-cleft (much cut in the "curled" garden vars.), the upper ones narrower and nearly entire: fls. yellowish. Old World.—Much cult., and occasionally runs wild.

Gàirdneri, Gray. Stem solitary, 1–4 ft.: lvs. mostly simply pinnate, with 3–7 linear or thread-like lfts., the upper lfts. usually entire, but the lower ones often divided: fr. with long style. Dry hills, in Calif. and Nev.—Int. 1881 by Gillett as an ornamental plant. Roots tuberous and fusiform. L. H. B.

CARÚMBIUM. See *Homalanthus.*

CÀRYA is treated under *Hicoria.*

CARYOPHÝLLUS, the Clove Tree, is now referred to *Eugenia.*

CARYÓPTERIS (Greek for *nut* and *wing*). *Verbenàceæ.* Small shrubs with deciduous opposite lvs. and blue or violet fls. in axillary cymes: corolla 5-lobed, one segment larger and fringed; stamens 4, exserted; fr. separating into 4 somewhat winged nutlets. About 6 species in E. Asia. Free-flowering, small shrubs, very valuable for their late blooming season; not hardy north; even if well protected they will be killed almost to the ground, but the young shoots, springing up freely, will flower profusely the same season. They require well-drained and sandy soil and sunny position; if grown in pots, a sandy compost of peat and leaf soil or loam will suit them, and they will flower in the greenhouse until midwinter. Prop. readily by cuttings of half-ripened wood in summer or fall under glass, and by seeds sown in spring.

Mastacánthus, Schauer (*C. incàna*, Miq. *C. Sinénsis*, Dipp.). Fig. 379. Suffruticose, 1–5 ft.: lvs. petioled, ovate or oblong, coarsely serrate, pubescent above, grayish tomentose beneath, 2–3 in. long: cymes peduncled, dense-fld.; fls. small, violet-blue or lavender-blue. Aug.–Nov. China, Jap. B.R. 32:2. B.M. 6799. R.H. 1892:324. R.B. 19:273. G.C. II. 21:149. Mn. 5:5. S.H. 2, p. 89.—Known in the nursery trade as "Blue Spiræa." There is also a new variety with white fls.

C. Mongòlica, Bunge. Lvs. lanceolate, almost entire: cymes with fewer but larger fls. R.H. 1872:450.

ALFRED REHDER.

CARYÒTA (old Greek name). *Palmàceæ*, tribe *Arèceæ*. FISH-TAIL PALM. Spineless, monocarpic palms, with tall, stout, ringed halms, at length bearing suckers. Lvs. disposed in an elongated terminal fringe, ample, twice pinnately divided; segments dimidiate-flabelliform, or cuneate, entire, or split, irregularly dentate, plicate, folded back in the bud: midnerves and primary nerves flabellate: petiole terete below: sheath keeled on the back, fibrous along the margins: ligule short; spadices usually alternately male and female: peduncle short, thick: branches long, pendent: spathes 3–5, not entire, tubular; bractlets broad: fls. rather large, green or purple: fr. the size of a cherry, globular, purple. Species, 12. Malaya, New Guinea, Australia.

Remarkable for the delta-shaped or fish-tail-shaped leaflets, which make the graceful, spreading fronds very attractive. They are excellent warmhouse palms, very useful for decoration, particularly when young. They are frequently planted out in protected places for the summer. Prop. by seeds and suckers. For culture, see *Palms*.

There being so many different genera to choose from in selecting plants for moderate-sized conservatories, the members of this genus are not very popular for providing small specimens. In a high, roomy structure, however, they are among the most ornamental of the tribe. They are quick-growing, with large, broad leaves, finely cut up, the small divisions resembling the tail of a fish; hence the name "Fish-tail Palm." After reaching maturity the plant begins flowering at the top, and continues downwards until the vitality of the stem is exhausted. Suckers are freely produced by some species, but these, as a rule, do not become so robust as the parent stem, owing probably to the soil becoming exhausted. Seeds are offered by most dealers. The young plants should be grown in a warm, moist atmosphere, the soil consisting of loam with about one-third of its bulk leaf-mold and sand in equal parts. They sometimes lose their roots if kept too cool and wet in winter.

mìtis, Lour. (*C. sobolífera*, Wall.). Caudex 15–25 ft. high, 4–5 in. in diam., soboliferous: petioles, leaf-sheaths and spathes scurfy-villous; lvs. 4–9 ft.; pinnæ very obliquely cuneiform, irregularly dentate, upper margins acute; pinnules 4–7 in. long. Burma to Malaya.

ùrens, Linn. WINE PALM. TODDY PALM. Caudex stout, 30–40 ft. high, 1 ft. thick, not soboliferous: lvs. 18–20 by 10–12 ft.; pinnæ 5–6 ft., curved and drooping, very obliquely truncate, acutely serrate, the upper margin produced and caudate; pinnules 4–8 in.: petiole very stout. India, Malaya. A.F. 12:295. Gng. 5:131.

Rumphiàna, Mart. Lvs. 2-pinnate, several feet long, the pinnules thick, sessile, 6 in. long or nearly so, oblong. Malaya.—Var. **Albertii**, Hort. (*C. Albertii*, Muell.), is in the trade. It is large and free-growing, the lvs. being 16–18 ft. long and two-thirds as broad; lf.-segments fan-shaped and oblique, toothed.

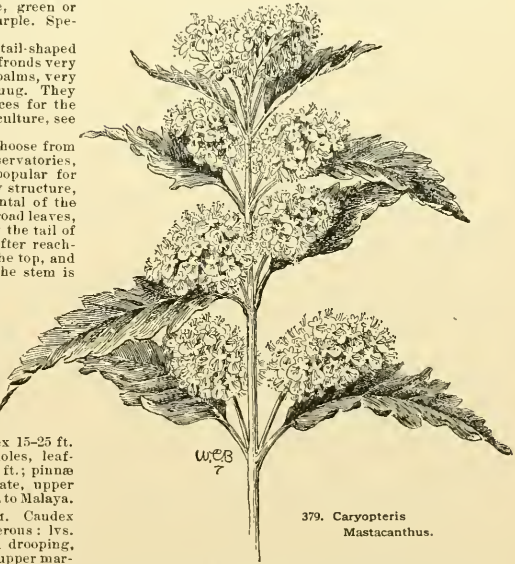
C. Blancòi, Hort., from the Philippines, is in the Amer. trade. It is probably a form of C. urens.

JARED G. SMITH and G. W. OLIVER.

CASHEW is *Anacardium occidentale*.

CASIMIRÒA (named in honor of Cardinal Casimiro Gomez). *Rutàceæ*. Evergreen trees: lvs. alternate, long-petioled, digitate, 3–7-foliolate; lfts. petiolulate, lanceolate, entire or slightly serrate, smooth or pubescent beneath: fls. regular, polygamo-diœcious; calyx 5-parted, small; petals 5, oblong, valvate, apex incurved; disc inconspicuous, circular; stamens 5, free; filaments subulate; anthers cordate: ovary sessile, on disc, globose, 5- or occasionally 6–8-lobed, 5-celled: stigma sessile, 5-lobed: ovules solitary in the cells, axillary: fr. a drupe, large, depressed-globose; pulp agreeable to taste, edible: seeds oblong, compressed, exalbuminose. Mexico. Two species, of which the following only is in cultivation:

édulis, LaLlave. WHITE SAPOTA. COCHIL SAPOTA. Large tree: trunk ashen gray, with warty excrescences: lvs. dark green, glossy: fls. greenish yellow, small: fr. greenish yellow when ripe, with strong, thick epicarp, ½in. thick, about the size of an orange: seeds nearly 1 in. long and half as wide. Mex. Cultivated to a limited extent in Calif.—The fruit of this species is said to have a delicious flavor, similar to that of a peach. They are used in Mexico as an aid in inducing sleep, and the leaves are used as a remedy for diarrhœa. Trees grown at Santa Barbara, Calif., are said to have reached an age of over 80 years and to have borne fruit regularly, though entirely neglected. The tree would probably succeed well in southern Texas, Louisiana and Florida. It grows on the coast of Mexico to an altitude of about 7,000 feet. It does not root well from cuttings, but may be raised from seeds. H. J. WEBBER.



379. Caryopteris Mastacanthus.

CASSABANANA. See *Sicana.*

CASSÁNDRA. See *Chamædaphne.*

CASSAVA. Consult *Manihot utilissima.*

CASSEBEÈRA (from a German botanist). *Polypodiàceæ.* A small genus of small Brazilian ferns allied to the maidenhair, but rarely seen in cultivation.

CÁSSIA (ancient Greek name). *Leguminòsæ.* SENNA. Several hundred herbs, shrubs or trees in many parts of the world, of which a very few are in cult. in Amer., mostly as border plants. Lvs. even-pinnate: fls. nearly regular (not papilionaceous), with the nearly equal calyx-teeth mostly longer than the tube; corolla of 5 spreading, nearly equal clawed petals; stamens 5 or 10, frequently unequal, and some of the anthers abortive: fr. a stalked pod which is either flat or terete, containing numerous seeds. The Cassias delight in a sunny exposure. Most of those which are cultivated here are herbs or herb-like shrubs, attractive for the finely cut foliage and the showy fls. Some of them are cultivated only in the extreme south. Prop. mostly by divisions and seeds,—the annual species always by seeds.

Senna leaves, used in medicine as a cathartic, are derived from various species, chiefly from *C. acutifolia* of Egypt, and *C. angustifolia* of India and other Old World tropics. The "Cassia lignea" of drug stores is made from a Cinnamomum.

A. *Hardy border plants: leaflets 6 or more pairs.*

Marylándica, Linn. WILD SENNA. Perennial, glabrous or nearly so, stems nearly simple: lfts. 6–10 pairs, oblong or lance-oblong and entire, short-acuminate or nearly obtuse: fls. in axillary racemes near the tops of the stems and often appearing as if panicled, bright yellow, wide open. New Eng. to Mich. and south, mostly in wet soil.—Grows 3–4 ft. high, and has attractive light green foliage.

Chamæcrista, Linn. PARTRIDGE PEA. Annual, erect or spreading, 2 ft. or less high: lfts. 10–15 pairs, small, narrow-oblong, mucronate, sensitive to the touch: fls. large, 2–5 together in the axils, canary-yellow and 2 of the petals purple-spotted.—Dry soil, Maine S. and W.

AA. *Tender plants, grown far south, or under glass: lfts. mostly fewer.*

B. *Tree, with very long, woody, indehiscent pods.*

Fistula, Linn. PUDDING PIPE TREE. Lvs. large, the lfts. 4–6 pairs, and ovate-acuminate: fls. in long lax racemes, yellow: pods cylindrical, black, 3-furrowed, 1–2 ft. long, containing 1-seeded compartments. India, but introduced in W. Ind. and other tropical countries. Sparingly cult. in S. Fla.—Furnishes the Cassia pods of commerce.

BB. *Shrubs or herbs, with shorter and more or less dehiscent pods.*

Sophèra, Linn. (*C. schinifòlia,* DC.). Shrub, 6–10 ft.: lfts. 6–10 pairs, lanceolate-acute: fls. yellow on many-fld. axillary and terminal peduncles, which are shorter than the lvs.: pod thin, tardily dehiscent. Oriental tropics. Int. in S. Calif.

tomentòsa, Linn. f. Shrub, 4–8 ft.: lfts. 6–8 pairs, oval-oblong and obtuse, white-tomentose beneath: fls. yellow. Mex.—Said to be a good winter bloomer in S. Calif.

corymbòsa, Lam. Shrub, half-hardy in middle states, 4–10 ft.: lfts. 3 pairs, oblong-lanceolate and somewhat falcate, obtuse or nearly so: fls. yellow, in long-stalked, small axillary and terminal corymbs. Argentina. B.M. 633. Gn. 50, p. 139.—The best known stove species.

artemesioìdes, Gaud. Tree-like shrub, soft-canescent and gray all over: lfts. 3–4 pairs, very narrow-linear: racemes axillary, 5–8-fld., the fls. deep yellow. Austral. —Int. in S. Calif. Withstands drought.

biflòra, Linn. Shrub, 4–8 ft.: lfts. 6–8 pairs, broad-oblong, very obtuse: fls. large, yellow, on 2–4-fld. peduncles, which are shorter than the lvs. S. Amer. B.M. 810.—Sparingly cult. in greenhouses.

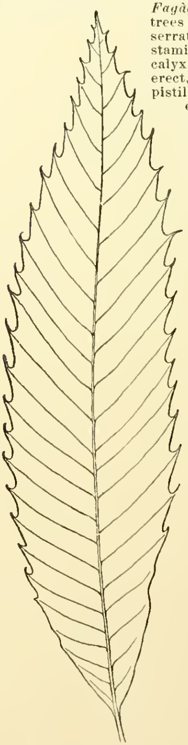
C. Schràderii, "yellow, dark spotted fls. in racemes, 2–3 ft.," is offered, but its systematic position is doubtful. L. H. B.

CASSÌOPE (Greek mythological name). *Ericàceæ.* Low, procumbent, evergreen, heath-like shrubs: lvs. small, usually imbricated and opposite: fls. solitary, nodding; corolla campanulate, 5-lobed; stamens 10, included: fr. capsular. Ten species in arctic regions and high mountains of N. Amer., N. Eu., N. Asia and Himal. Graceful, delicate plants, adapted for rockeries, flowering in summer. They are of somewhat difficult culture, and require peaty and sandy, moist but well-drained soil and partly shaded situation, though *C. hypnoides* grows best in full sun, creeping amongst growing moss. Drought, as well as dry and hot air, is fatal to them. Prop. readily by cuttings from mature wood in August under glass; also by layers, and by seeds treated like those of Erica. Formerly included under Andromeda.

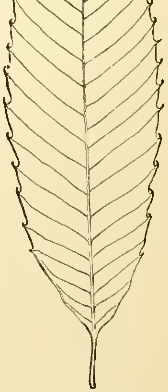
C. fastigiàta, Don. Ascending: lvs. imbricate, in 4 rows, with white fringed margin: fls. axillary, white. Himal. B.M. 4796. —*C. hypnoìdes,* Don. Creeping: lvs. linear, loosely imbricate: fls. terminal, deeply 5-cleft. Arctic regions. B.M. 2936. L.B.C. 20:1946.—*C. Mertensiàna,* Don. Erect or ascending to 1 ft. high: lvs. imbricate, in 4 rows, carinate on the back: fls. axillary, white or slightly tinged rosy. Sitka to Calif.—*C. tetràgona,* Don. Similar to the former, but lower, and the lvs. with a deep furrow on the back. Arctic regions. B.M. 3181.

ALFRED REHDER.

CASTÀNEA (ancient Latin name). *Cupulìferæ* (or *Fagàceæ*). CHESTNUT. Deciduous trees or shrubs, with alternate serrate lvs.: fls. monœcious, the staminate ones with 6-parted calyx and 10–20 stamens, in long, erect, cylindrical catkins; the pistillate ones on the lower part of the upper catkins, usually 3 together in a prickly involucre: fr. a large brown nut, 1–7 together in a prickly involucre or bur. Five species in the temperate re-



380. Castanea Americana. (× ½.)



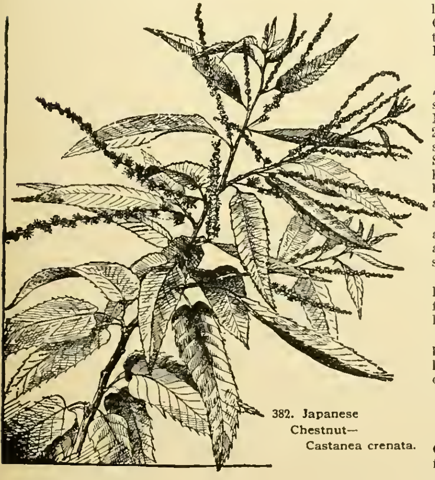
381. Castanea sativa. (× ½.)

gions of N. E. Amer., Eu., N. Afr. and Asia. Hardy ornamental trees or shrubs with handsome foliage, which generally is not injured by insects or fungi; very attractive when in bloom. *C. Americana* and *C. sativa* are large-sized trees, while *C. pumila* and *C. crenata* usually remain shrubby. The coarse-grained wood is much used for furniture, railway ties and fence-posts, as it is very durable in the soil. The Chestnut is extensively cultivated in Europe and E. Asia for its edible fruit. It grows best in well-drained soil on sunny slopes, and even in rather dry and rocky situations, but dislikes limestone soil. Prop. by seeds, sown in fall where there is no danger of them being eaten by mice or squirrels; otherwise they should be stratified in boxes and buried 1 or 2 feet deep in a warm soil until early spring, when they are sown in rows about 3 inches deep. If growing well they can be transplanted the following fall or spring 2 or 3 feet apart from each other, and planted where they are to stand after three or four years. They are also increased by layers in moist soil. Varieties are usually worked on seedling stock or on sprouts by whip-grafting above the ground when the stock is just beginning to push into leaf. Crown-grafting, root-grafting and budding are also sometimes practiced, but no method gives wholly satisfactory results, and usually only one-half take well. See *Chestnut.*

A. *Lvs. glabrous or nearly so at maturity.*

Americàna, Raf. (*C. dentàta*, Borkh.). Fig. 380. Tree, occasionally 100 ft.: lvs. cuneate, oblong-lanceolate, acuminate, coarsely serrate, nearly glabrous when young, 6–10 in. long and somewhat pendulous: fls. of heavy fragrance, in June or July: nuts ½–1 in. wide. S. Maine to Mich., south to Ala. and Miss. S.S. 9:440–41. Em. 187. G.F. 10:373.—The tallest, most vigorous-growing and hardiest species. The nuts, though smaller, have a better flavor than the European varieties.

sativa, Mill. (*C. vésca*, Gärtn.). Fig. 381. Tree, 50–80 ft.: lvs. oblong-lanceolate, coarsely serrate, slightly pubescent or tomentose beneath when young, nearly glabrous at length, 5–9 in. long, erect: nut over 1 in. wide. June. From S. Eu. and N. Afr. to China. Gn. 50, p. 389. Gng. 3:209.—There are some garden forms with variegated lvs., and others, of which var. **asplenifolia,** Lodd., with laciniately cut and divided lvs., is the most remarkable. Of several varieties cultivated for their fruit, Paragon, a precocious kind, and Numbo, a variety with very large fr., are the most extensively planted in this country. See *Chestnut.*



382. Japanese Chestnut—Castanea crenata.

crenàta, Sieb. & Zucc. (*C. Japónica*, Blume). Fig. 382. Shrub or tree, to 30 ft.: lvs. elliptic or oblong-lanceolate, usually rounded at the base, acuminate, crenately serrate, or the teeth reduced to a long, bristle-like point, slightly pubescent when young, glabrous at length or only pubescent on the veins beneath, 3–7 in. long, erect: nut over 1 in. wide. Japan, China.—Shrubby and very precocious; it usually begins to fruit when about six years old. Hardy as far N. as Mass.

AA. *Lvs. whitish tomentose beneath.*

pùmila, Mill. CHINQUAPIN. Shrub or small tree, rarely 50 ft.: lvs. cuneate, elliptic-oblong or oblong-obovate, acute, serrate, teeth often reduced to bristle-like points, 3–5 in. long: fr. usually solitary, ovate, small, about ⅓in. wide and ¾–1 in. long. May, June. From Pa. to N. Fla. and Texas. S.S. 9:442–43.—Useful for planting on dry and rocky slopes; attractive when in flower, and again in fall, with its abundant light green burs among the dark foliage. The closely allied *C. alnifolia*, Nutt., in the S. states, grows only a few feet high, and has larger lvs. and fr. ALFRED REHDER.

CASTANEA of commerce. The nuts of *Bertholletia.*

CASTANÓPSIS (*Castanea* and *opsis*, chestnut-like). *Cupulíferæ* (or *Fagàceæ*). Evergreen trees or shrubs, closely allied to *Castanea* and in some degree also to *Quercus*, with sometimes entire lvs. and spiny or tuberculate involucre. About 25 species, chiefly in the trop. and subtrop. mountains of Asia, and 1 in W. N. Amer., which is the hardiest, and is sometimes cultivated. For propagation, see *Castanea.*

chrysophýlla, DC. (*Castànea chrysophýlla*, Hook.). Tree, to 150 ft., shrubby at high elevations: lvs. ovate-oblong or oblong-lanceolate, narrowed at both ends, entire, dark green above, coated with minute golden yellow scales beneath, 2–6 in. long: nut about ½in. wide, usually solitary in the spiny involucre. Summer. Ore. to Calif. S.S. 9:439. B.M. 4953. G.C. III. 22:411. F.S. 12:1184. R.B. 7:240.—A highly ornamental tree with beautiful foliage, hardy only in the warmer temperate regions, but the shrubby form is much hardier.

ALFRED REHDER.

CASTANOSPÉRMUM (*Chestnut seed*, because of the taste of the seeds). *Leguminòsæ.* One tall Australian tree, with odd-pinnate lvs., the lfts. broad, thick, entire; fls. large, orange-colored, in lateral racemes; petals 4; stamens free: ovary long-stipitate, many-ovuled: seeds larger than Italian chestnuts, globular. **C. austràle,** Cunn. & Fraser, is the species known locally as "Moreton Bay Chestnut." The seeds are roasted and eaten. Int. in S. Calif.

CASTILLÈIA (a Spanish botanist, *D. Castillejo*). *Scrophulariàceæ.* PAINTED CUP. Herbs, with small, solitary fls. in terminal, gaudy-bracted spikes, mostly N. Amer.: corolla tubular, sometimes flattened laterally, 2-lipped; lower lip smaller, more or less 3-toothed: stamens 4: lvs. alternate, entire or cut. *C. coccinea*, Spreng., the common Painted Cup of the E. states, has been offered by collectors. It has showy laciniate bracts. Castilleias are little known in gardens. They are of simple culture.

indivìsa, Engelm. Annual, 1–2 ft.: lvs. lance-linear and entire (or sometimes 2–3-lobed): bracts not laciniate, bright red and showy. Texas.—Blooms early in spring.

affìnis, Hook. & Arn. Perennial, 1–2 ft.: lvs. narrow-lanceolate, entire or the upper ones toothed at apex: fl.-bracts becoming short and broad, red: spike lax below. Calif., in moist soils.—Int. 1891 by Orcutt.

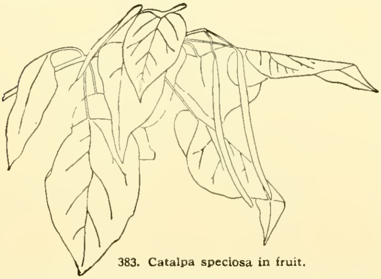
foliolòsa, Hook. & Arn. Woolly perennial, 1–2 ft., the base woody: lvs. small (1 in. or less long), narrow-linear, crowded or fascicled: bracts 3-parted: spike dense. Calif., in dry soils.—Int. 1891 by Orcutt.

L. H. B.

CASTOR BEANS are discussed under *Ricinus.*

CASUARÌNA, (said to be derived from *Casuarius*, the Cassowary, from resemblance of the branches to the feathers). *Casuarinàceæ.* BEEFWOOD. SHE OAK. A score or more of trees and shrubs in the Australian region and the Indies, being the only plants of the family. They are usually classified near the walnut and hickory tribes, although very unlike them—or other known plants—in botanical characters. They are jointed and leafless plants, somewhat suggesting Equisetums in gross appearance of branches. The fls. are unisexual. The staminate are in cylindrical terminal spikes, each fl. consisting of a stamen inclosed in 4 scales, 2 of the scales being attached to the filament. The pistillate fls. are in dense heads borne in the axils, and this head ripens into a globular or oblong cone; they are composed of 1-ovuled ovaries subtended by bracts. The fruit is a winged nutlet. The branches are long and slender. Beefwood is planted in the extreme south for its very odd habit, and also to hold sands of the sea coast. The wood burns quickly, and is very hard and durable. The redness of the wood has given the popular name, Beefwood. Remarkable for rapid growth. They grow well in brackish and alkaline soils. Prop. by seeds and cuttings.

equisetifòlia, Linn. Tree, becoming 150 ft. high in favorable climates, and a most rapid grower. Branches drooping, pale green, simple, 6–8-angled or terete, the internodes very short (less than ¼in.): sheath-teeth 7 (6–8) lanceolate and appressed: staminate cone nearly terete: pistillate cone short-peduncled, ellipsoidal, about 12-sided. Widely distributed in Old World tropics, and the best known species in this country (S. Fla. and Calif.).—The wood is valuable for many purposes.

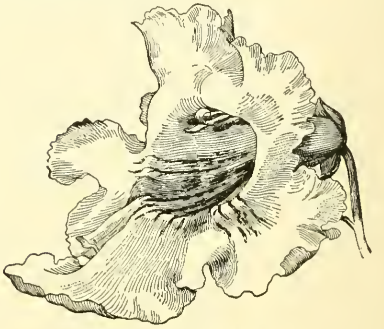


383. Catalpa speciosa in fruit.

strícta, Dryand. Becoming 20–30 ft. high: branches erect, simple, 6–7-angled, scarcely green, internodes short, as in the latter: sheath-teeth usually 7, ovate-lanceolate and appressed: staminate cone slender; pistillate cone nearly sessile, oblong (sometimes staminate above), about 14-sided. Austral.

torulòsa, Dryand. (*C. tenuíssima*, Sieber). Reaches 70 or 80 ft.: branches erect, capillary, mostly terete, internodes short: sheath-teeth 4, very short, triangular appressed: staminate cones filiform: pistillate cones ellipsoidal, 8–10-sided. Austral. L. H. B.

CATÁLPA (the Indian name of *C. bignonioides*). *Bignoniàceæ*. Deciduous trees with opposite or whorled, long-petioled, large and simple lvs.: fls. in large, showy panicles; corolla tubular-campanulate, 2-lipped, with 2 smaller upper and 3 larger lower lobes; calyx 2-lipped: fertile stamens 2: fr. a very long, cylindrical capsule, separating into 2 valves, with numerous small, oblong, compressed seeds bearing a tuft of white hairs on each end. Eight species in N. Amer., W. India and E. Asia, of which 4 are hardy in the colder temperate regions. Highly ornamental trees with large, bright green foliage and beautiful white or yellowish fls. in large, showy panicles. The coarse-grained and soft wood is very durable in the soil, and, therefore, much valued for fence-posts and railway ties. They grow in almost any somewhat moist soil, and are hardy as far north as New England. Prop. by seeds sown in spring, in the north, best with slight bottom heat, or by cuttings from ripe wood, the varieties often by softwood cuttings in early summer or by grafting on seedlings or on roots under glass in spring; also increased sometimes by layers and root cuttings.

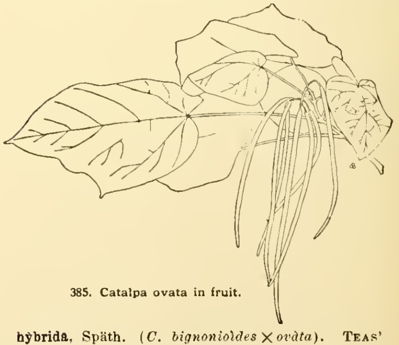


384. Catalpa speciosa. Natural size.

A. *Fls. white, with two yellow stripes inside, and spotted purplish brown.*

bignonioìdes, Walt. (*C. syringifòlia*, Sims). Tree, 20–50 ft.: lvs. often whorled, cordate-ovate, abruptly acuminate, sometimes with 2 lateral lobes, pubescent beneath, 5–8 in. long, of unpleasant odor: panicles many-fld.; fls. about 2 in. in diam., thickly spotted inside: pod 6–20 in. long, ¼–⅓ in. thick. June, July. S. states, north to Tennessee, often naturalized elsewhere. B.M. 1094. L.B.C. 13:1285. S.S. 6:288–89. Gng. 6:118–119. G. F. 3:537, 539. J. H. III. 32:121. G.C. III. 21:298.—Usually low tree, with very wide-spreading branches. There are some garden forms. Var. **aùrea**, Hort. Lvs. yellow. Var. **nàna**, Hort. (*C. Búngei*, Hort., not C. A. Mey.). Forms a dense, round bush, often grafted high. Gng. 3:195. Var. **purpùrea**, Hort. Lvs. purple when young, green at length.

speciòsa, Warder. Fig. 383, 384. Tree, to 100 ft.: lvs. cordate-ovate, long-acuminate, pubescent beneath, 8–12 in. long: panicles usually few-fld.: fls. about 2½ in. in diam., inconspicuously spotted inside: pod ½–¾ in. thick. June. From southern Illinois and Indiana to Louisiana and Mississippi. S. S. 6:290–91. R. H. 1895:136.—A very desirable ornamental tree, closely allied to the former, but taller and hardier.



385. Catalpa ovata in fruit.

hỳbrida, Späth. (*C. bignonioìdes* × *ovàta*). TEAS' JAPAN HYBRID. Large tree, intermediate between the parents: the lvs. resemble more those of *C. ovata*, and are purplish when unfolding, but much larger and slightly pubescent beneath, while the fls. are more like *B. bignonioides*, with the inflorescence often twice as long. Originated at J. C. Teas' nursery, at Baysville, Ind., about 20 years ago. G.F. 2:305. Gt. 47:1454.—A very valuable tree, flowering profusely; of rapid growth and hardy. Seedlings usually resemble *C. ovata*.

AA. *Fls. yellow, striped inside orange and spotted dark violet, about 1 in. in diam.*

ovàta, Don (*C. Kàmpferi*, Sieb. & Zucc.). Fig. 385. Tree, to 20 ft.: lvs. broadly cordate-ovate, abruptly acuminate, often 3–5-lobed, nearly glabrous at length, with reddish spots in the axils of the veins beneath, 5–8 in. long: panicles many-fld., 4–7 in. long, fragrant. June. China, much cult. in Japan. B.M. 6611. I.H. 9:319.—Hardier than the American species.

C. Bùngei, C. A. Mey. Allied to C. ovata. Lvs. truncate at the base, long acuminate. 3–5 in. long: fls. large, nearly white, in few-fld. panicles. China.—*C. Bùngei*, Hort.=C. bignonoides, var. nana.—*C. longíssima*, Sims. Tree, to 50 ft.: lvs. oblong-ovate, coriaceous: fls. small, white. W. Ind., often planted as shade tree in Cuba.

ALFRED REHDER.

CATANÁNCHE (Greek name, referring to ancient custom of using the plant in love-making). *Compósitæ*. A half dozen annual or perennial herbs of the Mediterranean region, with the lvs. crowded at the base of the stem, and linear or lanceolate. Head long-peduncled, blue or yellow. Akene oblong, ribbed and generally villose or setose. Pappus of 5–7 scales. Of easiest culture in any garden soil, particularly if light. Useful for cutting.

cærùlea, Linn. Perennial, 2 ft.: lvs. tomentose, lanceolate and few-toothed: fl.-heads 2 in. across, with wide, flat-toothed blue rays, on long, slender stems. Blooms in June, July and Aug. S. Eu. B.M. 293. R.H. 1890, p. 523. Var. **álba**, Hort., has white fls. Var. **bícolor**, Hort., has white margin and blue center. Often used as Everlastings. Prop. by seeds and division.

L. H. B.

CATASÈTUM (Greek for *downward* or *backward*, and *bristle*). *Orchidàceæ*, tribe *Vándeæ*. Flowers globose or expanded; labellum fleshy; column erect; pollinia 2. Stems short fusiform; lvs. plaited, membranaceous; scapes basal, fls. in racemes; the column provided with sensitive appendages which, when touched, cause the pollen-masses to fly out. There are about 50 or 60 species in the Amer. tropics, either terrestrial or epiphytic. The fls. are in racemes or spikes, firm in texture, and white or in shades of green, yellow, brown or purple. Catasetums are not much cultivated, since most of the species are not showy, but they are interesting to the botanist and amateur because of the striking ejection of the pollen-masses. Gardeners often have trouble with Catasetums, but they are not difficult to grow if given good care. They need a high temperature, long period of rest, and free supply of water during the growing season. They are grown in both pots and baskets. Readily propagated by dividing the plants at the base; also from very ripe pseudobulbs cut in pieces and put in sand. The genus includes Monachanthus and Myanthus.

A. *Flowers white.*

Bungeròthii, N. E. Brown. Stems 8–9 in. tall; sepals larger than the petals, nearly 2 in. long; labellum tending toward concave, roundish; appendages thickish. Equador. B.M. 6998. G.C. III. 1:142. I.H. 37:117; 34:10. Gn. 33:646. A.F. 6:633.—A striking plant.

AA. *Fls. yellowish, more or less marked with brown or red.*

macrocárpum, Rich. (*C. Cláveringi*, Lindl. *C. tridentàtum*, Hook.). Fls. large, nearly 3½ in. across; petals and sepals yellow, verging on green, spotted with reddish brown; labellum yellow. Guiana. B.M. 2559, 3329. I.H. 33:619.

fimbriàtum, Lindl. & Paxt. Pseudobulbs, 2–3 in. long: raceme pendulous, 8- or more-fld.: fls. 2½ in. across; sepals whitish or pale yellow, closely barred with red. Braz. B.M. 7158. A.F. 6:609.

longifòlium, Lindl. Pseudobulbs deflexed: lvs. narrow and glaucous, reaching 3 ft.: fls. on drooping, compact spikes; sepals and petals greenish yellow tipped with dull red; lip helmet-like, orange-yellow. Guiana. Epiphyte.

AAA. *Fls. essentially red or brownish.*

decípiens, Reichb. f. Fls. 1½ in. across; sepals and petals lanceolate, red-brown and spotted; lip saccate, yellowish outside and red-brown inside. Venezuela. A.F. 6:609.

AAAA. *Fls. many-colored, grotesque.*

Gnòmus, André. Pseudobulb, oblong-ovate and alternate, articulated: fls. in a long loose raceme on slender pedicels; sepals greenish and purple-barred; 2 lateral petals spreading, concave, purple; lip bluntly conical, olive-green spotted outside, ivory white within, fringed above. S. Amer. I.H. 24:270. A.F. 12:293.

C. barbàtum, Lindl. Fls. green, blotched with purple. Guiana.—*C. callòsum*, Lindl. Odd: fls. with chocolate-brown, narrow-lanceolate sepals and petals; lip greenish, speckled with red. Venezuela. B.M. 4219, 6648.—*C. Christyànum*, Reichb. f. Sepals and petals usually chocolate; lip greenish yellow, purple fringed. S. Amer.? G.C. III. 18:617.—*C. díscolor*, Lindl. Fls. purple. An old sort, now rarely seen. Braz.—*C. Garnettiànum*, Rolfe. Allied to C. barbatum: fls. small; sepals and petals very narrow, green, with large bars of red-brown: lip white, fringed. Amazon. B.M. 7069.—*C. imperiàle*, Lind. & Cogn. Sepals and petals ovate-acute, white, purple spotted; lip orbicular-cordate, purple in center and white margined. G.C. III. 17:329. S.H. 1, p. 369. J.H. III. 30:25.—*C. Líndeni*, Cogn. Fls. large (as of C. Bungerothii); sepals and petals yellow, with purplish spots and bars; lip yellow, spotted at base. G.C. III. 17:329. S.H. 1, p. 369.—*C. mirábile*, Cogn. Fls. very large, the sepals and petals oblong-lanceolate, and yellowish, with purple spots and bars; lip kidney-shaped, bright yellow with 2 purple spots, toothed. G.C. III. 17:329. S.H. 1, p. 369.—*C. Scúrra*, Reichb. f. Compact: fls. fragrant, yellowish white, green-veined; lip 3-lobed. Guiana. G.C. II. 7:304, 305.—*C. splêndens*, Cogn. Intermediate between C. Bungerothii and C. macrocarpum: sepals greenish white with purplish center; petals white with many purple spots: lip cream-color, purple-marked. Runs into many forms: Var. album, Lind. & Cogn., white or nearly so. Var. Aliciæ, Lind. & Cogn. Fls. large; sepals and petals purplish; lip white, toothed. Var. aureo-maculatum. Bossch. Yellow. I.H. 43:54. Var. atropurpureum, Hort. Blackish purple.—*C. Warscewiczii*, Lindl. & Paxt. From Panama. Now rarely seen.

OAKES AMES.

CATCHFLY. Consult *Silene*.

CATECHU. See *Acacia Catechu*.

CATERPILLARS. The worm-like pods of *Scorpiùrus vermiculàta*, Linn., *S. subvillòsa*, Linn., and others (*Leguminòsæ*), are sometimes used as surprises in salads and soups; and for that purpose they are cult. in parts of Europe, and seeds are sold in this country. They are sometimes catalogued as Worms. They are annuals of the easiest culture. The pods of *Medicàgo scutellàta*, Mill., and others are known as Snails. The pods are not edible. European plants. A.G. 13:681.

L. H. B.

CATMINT or CATNIP. See *Nepeta*.

CAT-TAIL. *Typha*.

CÁTTLEYA (William Cattley, an early English naturalist). *Orchidàceæ*, tribe *Epidéndreæ*. Epiphytes of tropical America. Pseudobulbous: leaf-blades 1–3, coriaceous: fls. usually terminal, large, fleshy or membranaceous; petals and sepals nearly equal, or the former much broader: labellum cucullate, usually trilobed, proximal part inclosing the fleshy, clavate column, except in *C. Aclandiæ* and *C. bicolor*: pollen masses 4 (2 pairs), with short appendages. A genus generally cultivated for its large, showy flowers, which for intensity of color have few, if any, equals in the family of orchids. Most of the species do satisfactorily under artificial conditions, although there is an opinion prevalent that they degenerate or "run out." Naturally, some kinds are difficult to grow, since the horticulturist is not well enough informed concerning their requirements, but there is no reason why the majority of the species should degenerate if properly treated. The genus Cattleya was founded on *C. labiata* by John Lindley in 1824. As a genus, it is very closely allied to Lælia, being distinguished by having two pollinia (4 pollen masses), whereas that genus has four (or 8 pollen masses.)

OAKES AMES.

The Cattleyas are indigenous to the western hemisphere only, Central and S. America being the regions where they abound, particularly in the latter, from the different countries of which large quantities are imported yearly. During the last few years the collecting and importing of Cattleyas into the U. S. has assumed large proportions, owing to a continually and steadily increased demand, not only by amateurs but also by the trade in general. There are two particular reasons for this increased demand: First, the exquisitely beautiful flowers, combined with size and marvelous colors, and adapted for decorations at all sorts of functions, they being never out of place; second, their easy culture. Florists and amateurs alike are beginning to realize that, after all, orchids are only plants, and if only treated in a common-sense way they are by far easier to grow than a good many plants, and especially so the Cattleyas, provided some attention is paid to their requirements.

Cattleyas in general delight in a genial, moist atmosphere and a temperature ranging all the way from 55° to 70°. They all require an abundant supply of water, accompanied by a liberal supply of air and light, during their respective growing seasons. A Cattleya house should, if possible, have bottom and top ventilators, which when open produce a current of fresh air impossible to obtain or imitate in any other way, and in which these plants delight. The glass should be shaded with a thin coat of naphtha and white lead, enough to prevent the sun from burning the plants, for, while they enjoy all the light possible, the full sun in our climate is too strong for them, and they are liable to dry and shrivel, and thus lose their natural luxuriance. The shading, however, may be removed entirely during the dullest winter months. Cattleyas will grow equally well in baskets, pots, or on boards; the former are preferable where limited quantities are grown, inasmuch as they are easily managed and may be hung up or taken down or moved from one place to another with the greatest ease. The large blocks or boards are to be recommended where large quantities of plants are grown for cut-flowers, being more economical in every sense of the word. When boards are used, the width ought not to be less than 10 inches, as the plants would very soon grow over the sides of the boards; the length may be adjusted to suit the house, but should not exceed 5 feet—anything larger is liable to be too clumsy to handle conveniently.

The best potting material is soft, fibrous peat, with a sprinkling of live sphagnum intermixed. Too much stress cannot be laid on soft peat, as frequently too coarse material is used, resembling a mass of wire, with the result that the water benefits the plants but very little, and root-action is slow, if taking place at all. One thing is imperative in the cultivation of Cattleyas, in whatever receptacles they are grown: they must be firm, without going to the extreme of ramming in the stuff too hard. A plant lying loose in a basket or a pot will never grow well, but will gradually dwindle away to nothing. Where boards or large blocks are used, the plants are fastened on by means of galvanized staples, inserting a piece of peat between the staple and the rhizome, so as to keep the staple from burning while new. In this way freshly imported Cattleyas may be fastened on to clean boards or blocks, and by liberal overhead syringing the roots soon appear, when a mixture of chopped peat and sphagnum may be shaken in between the plants to cover the roots. In using baskets, it is advisable to use them shallow and less material, the compost thus keeping fresh and sweet for a considerable period of time. Cattleyas, as previously mentioned, enjoy a copious supply of water during their respective growing seasons. In our climate the best method is to use the hose, and water overhead, which, if adhered to, will cause the plants to soon assume a natural green color and luxuriance common to them in their native habitats. Besides, the overhead watering will keep down vermin, such as scales, etc. By the so-called resting season of Cattleyas is generally understood the time after the plants have finished the flowering bulb, and until they begin to send up the next growth. During this time, when they are, in a sense, dormant, the quantity of water should be diminished, which causes the new eyes to move slowly and break strong. As soon, however, as the new breaks are fairly under way they should be encouraged in the way of moisture, when the new roots will soon appear and the plants go ahead with renewed vigor. If the plants are in baskets, suspended under the roof, they should be taken down at intervals and dipped thoroughly. Hand-in-hand with a copious watering must go a liberal supply of light and air at all times. In order to obtain the best results, the plants should be placed as near to the light as possible—say, from 1–3 feet from the glass, according to kinds and to the space available in the house. Kinds such as *C. Trianæi*, *C. labiata*, *C. Mendelii*, *C. Mossiæ* and *C. Harrisoniana* will grow and flower well in any part or position of the house, provided they have plenty of light and air, but 3 feet is the maximum distance from the glass at which any of the Cattleyas should be placed, to be successfully grown. A capital illustration of the above is, for instance, *C. gigas*, which does admirably suspended under the ridge of the house, where it receives the full benefit of air and light, in which position it flowers profusely, while if grown on a bench or stage it rarely flowers.

The best twelve varieties of Cattleyas for commercial purposes, and, indeed, for amateurs also, are the following: C. Trianæi, flowers Jan.–March; Schrœderiana, fls. March, April; Mossiæ, fls. April, May; Mendelii, fls. April, May; Warneri, fls. May, June; gigas, fls. June, July; chrysotoxa, fls. June, July; Gaskelliana, fls. Aug., Sept.; Harrisoniana, fls. Sept., Oct.; labiata, fls. Oct., Nov.; Bowringeana, fls. Oct., Nov.; Percivaliana, fls. Dec.

With a number of plants of each of the above kinds, it will be seen that it is possible to have a succession of flowers from one end of the year to the other.

JOHN E. LAGER.

Index: Aclandiæ, 18; *amethystina*, 21; amethystoglossa, 25; aurea, 2; *autumnalis*, 16; bicolor, 19; Bluntei, 6; *Bogotensis*, 1; Bowringeana, 16; *bulbosa*, 30; *candida*, 23; *Carrierei*, 1; Chocoensis, 9; chrysotoxa, 2; citrina, 17; *Dawsonii*, 5; dolosa, 21; Dowiana, 2; Eldorado, 3; *Ernesti*, 1; Forbesii, 22; Gaskelliana, 4; *gigas*, 12; *gloriosa*, 1; granulosa, 26; guttata, 24; *Harrisoniæ*, 23; Harrisoniana, 23; *Holfordi*, 30; *imperialis*, 1; intermedia, 21; *Keteleerii*, 25; labiata, 1; Lawrenceana, 14; *Leeana*, 1; *Lemoniana*, 1; Leopoldii, 24; Loddigesii, 23; Luddemanniana, 5; luteola, 30; *Massangeana*, 1; maxima, 13; Mendelli, 6; *Morganæ*, 1; Mossiæ, 7; *Nalderiana*, 1; nobilior, 31; *pallida*, 1; Parthenia, 21; *Peetersii*, 1; Percivaliana, 8; *Perrinii*, 1; *Prinzii*, 25; punctatissima, 21; *quadricolor*, 9; *Reineckiana*, 7; *Rœzlii*, 1; *Rollissoni*, 1; Sanderiana, 12; Schilleriana, 29; Schofieldiana, 27; Schroederiana, 9; Skinneri, 15; *speciosissima*, 5; splendens, 28; superba, 28; Trianæi, 9; Victoria-Regina, 20; *violacea*, 28; *virginalis*, 1; *Wagneri*, 7; Walkeriana, 31; Wallisii, 3; Warneri, 10; *Warocqueana*, 1; Warscewiczii, 11.

The following Amer. trade names belong to Lælia: *crispa*, *lobata*, *marginata*, *pumila*. See, also, the list of hybrids at the close of *Cattleya*. For *C. aurantiaca*, see *Epidendrum*.

Of several of the following species, there are named vars. in the Amer. trade, varying in stature, habit, and particularly in the color of the flowers.

A. *Blossoms from a leafy pseudobulb.*

B. *Fls. membranaceous, not fleshy.*

C. *Number of fls. not more than 5, or rarely 6: pseudobulb 1-leaved.*

1. **labiàta**, Lind. Pseudobulbs 4–8 in. high, compressed, from stout creeping rhizomes: leaf-blades broadly ovate or oblong, about 6 in. in length: fls. 2–5, ranging in color from rosy mauve to white; petals 3½ in. long, 2½ in. wide, ovate-oblong, several times broader than the sepals; labellum 2½–3½ in. long, expanded portion 2 in. across, blotched or veined with crimson or magenta-purple, the margin crisped and paler; the posterior part stained with yellow and veined with crimson-purple. Blooms in autumn. B.M. 3998. P.M. 4:121. Gn. 51:1107. G.C. III. 19:13. R.B. 22:25. A.G. 17:65; 19:811. F.R. 1:8; 2:531. Gng. 2:275. F.E. 9:327. A.F. 6:607.—Int. in 1818 from the Organ moun-

tains of South America. It was lost for many years and became exceedingly rare, but recently its rediscovery has made it a common orchid, and many beautiful varieties are in cultivation. Some of the varieties have heretofore been regarded as species, but as the points of distinction are too slight to be specific, it has seemed best to put such forms as *C. Warneri*, *C. Trianæi* and *C. Mossiæ* in their proper place under the original species. *C. labiata* is probably the most useful species of orchid. Immensely variable: some of the leading varieties are described below. These forms are regarded variously as species, varieties or sub-varieties, by different authors. Besides the names given below, the following are to be referred to *C. labiata*: *C. Bogoténsis*, Lind.; *C. Carrièrei*, Houll.; *C. Ernesti*, Hort.; *C. gloriòsa*, Carr.; *C. imperiàlis*, O'Brien; *C. Leeàna*, Hort.; *C. Lemoniàna*, Lindl.; *C. Massangeàna*, Reichb. f.; *C. Mórganæ*, Warner; *C. Nalderiàna*, Reichb. f.; *C. pállida*, Lindl. & Paxt.; *C. Peètersii*, André; *C. Pérrinii*, Endl. (not Lindl.); *C. Ræzlii*, Reichb. f.; *C. Róllissonii*, Moore; *C. virginàlis*, Lindl. & André; *C. Warocqueàna*. More than 100 other specifically made names are referred to this species. There are white-fld. forms of nearly all the vars.

2. Var. **Dowiàna**, Veitch (*C. Dowiàna*, Batem.). Fls. nankeen-yellow, except for the disproportionately large labellum; petals about twice as wide as the sepals, about the same length as the labellum, wavy margined, obtuse; sepals lanceolate, acute; labellum amply expanded, margin crisped, surface velvety, dark purple, beautifully and finely veined with golden yellow lines, which radiate from the median line. Strong plants produce 3 or more fls. on each peduncle. B.M. 5618. R.H. 1869:30.—Discovered in Costa Rica by Warscewicz. Little was known about it until 1864, when Mr. Arce found plants and sent them to England, where they flowered in the autumn of 1865. There are now several geographical varieties of this orchid, the one called **aùrea** or **chrysotóxa** (I.H. 30:493. J.H. III. 31:253. R.H. 1892:492. A.F. 6:563; 12:10. F.R. 1:76), being more easy to grow. This variety is recognized by having deeper yellow petals and sepals, and more copious veining on the labellum. The fragrance of this orchid suggests vanilla, and renders it readily distinguishable from other varieties.

3. Var. **Eldoràdo**, Veitch (*C. Eldoràdo*, Linden). Fls. pale rosy lilac, except for the more or less tubular labellum, which bears at its distal end a border of crimson-magenta, which shades into an orange-yellow disc; petals narrowly ovate; sepals lanceolate. Int. in 1866 from Braz. F.S. 18:1826.—The fragrance of this orchid is very characteristic, while its fls., which are much smaller than in the type, are produced in July and Aug. There are several recognized forms. Sub-var. **crocàta** is paler in the sepals and petals. Sub-var. **Wállisii** is a white form (*A. Wállisii*, Linden).

4. Var. **Gaskelliàna**, Hort. Petals and sepals usually narrower than in the type, perhaps paler. Blooms from June to Aug. The usual forms are not distinct enough to be varietal. Venezuela. I.H. 33:613. A.F. 6:185. Gng. 5:72.

5. Var. **Luddemanniàna**, Hort. (*C. Luddemanniàna*, Reichb. f. *C. Dáwsonii*, Warner. *C. speciosissima*, Hort.). Petals and sepals delicate rose color or pink-lilac, petals much broader than the sepals; labellum wavy or crisped at the margin, compressed dorsiventrally, apex deeply divided, front lobe deep crimson-purple, the color carried back into the throat in streaks, front part of the lateral lobes nearly white, margined with blush-rose; throat yellowish. Venezuela.

6. Var. **Méndellii**, Backhouse (*C. Méndellii*, Hort.). Fig. 386. Petals and sepals pale rosy mauve to white; labellum blotched with crimson-purple, throat yellowish. Blooms in May and June or earlier. Of this variety there are many beautiful forms. Eastern Cordilleras, New Granada. S.H. 2:413.—*C. Blúntei*, Hort., is a pure white form with a beautifully fringed lip.

7. Var. **Móssiæ**, Hook. (*C. Móssiæ*, Parker). Habit as in type, or very similar; petals broadly ovate; labellum broad in expanded part, crisped at the usually whitish margin; throat yellow lined with purple, expanded portion mottled with crimson; frequently much intermingled with orange-yellow. La Guayra. B.M. 3669. R.H. 1857, p. 322. S.H. 1:149. A.G. 14:70. A.F. 6:563. —*C. Wágneri*, Hort., is a white form of this Cattleya. *C. Reineckiàna*, Reichb. f., is the most beautiful form. It has white sepals and petals and a richly colored labellum.

8. Var. **Percivaliàna**, Reichb. f. (*C. Percivaliàna*, O'Brien). Fls. rather small; petals and sepals deeper colored than in the type species; labellum relatively small, pale at margin; throat deep yellow streaked with crimson, expanded part crimson-purple. F.R. 1:298, J.H. III. 32:179.

386. Cattleya labiata, var. Mendellii.

9. Var. **Triànæi**, Veitch (*C. Trianæi*, Lind. & Reichb. f. *C. quadrícolor*, Lindl.). Fig. 388. Foliage more robust, perhaps, than in the type species, though, of course, cultivation has much to do with this; petals broader than in the type species, ovate-rhomboid; exceedingly variable in color; expanded portion (not usually so wide or spreading as in *C. labiata*) crimson-magenta, the margin less wavy than in the other varieties. New Grenada. B.M. 5504. R.H. 1860, p. 406–7. A.G. 17:177. Gng. 3:151. A.F. 6:607; 13:715. F.E. 9:325. F.R. 1:672–3. S.H. 1:11, 27; 2:403, 405.—The fls. are produced 3–5 on the stout peduncles. Sub-var. **álba.** White fls., yellow blotch in throat. Sub-var. **Chocoénsis**, Hort. Very similar to the above, but the fls. have the appearance of not wholly expanding. Colombia. I.H. 20:120. A.F. 6:563. Sub-var. **Schrœderiàna**, Hort. (*C. Schrœderiàna*, Reichb. f.). Fragrant; petals and sepals vary from white to pale rosy mauve; labellum has more orange-yellow than usual. Blooms at about the same time with the above, and on account of its pale fls. is a valuable variety. G.C. III. 20:73. A.G. 15:211. F.E. 9:331.—*C. Trianæi* is probably the most popular single garden orchid.

10. Var. **Wárneri**, O'Brien (*C. Wárneri*, Moore). Very similar to *C. labiata* itself, differing from it, perhaps, only in its blooming season. May, June and July. S. Brazil. A.F. 6:563.

11. Var. **Warscewiczii**, Reichb. f. Fls. large; labellum yellow in the throat, streaked with magenta-red, the infolding portion similar in color to the expanded portion, which is uniformly crimson-purple. New Granada. G.C. III. 22:163.—At the entrance to the throat there are usually two yellow blotches, or "eyes."

12. Var. **Sanderiàna**, Hort. (*C. gìgas*, Lind. & André). Fig. 387. A noble-fld. form, which, besides being rich in color, is larger than the usual varieties of *C. labiata*. New Grenada. I.H. 21:178. Gn. 45, p. 445. G.F. 1:437. A.G. July 23, 1898, Suppl. F.R. 1:77 and 674. F.E. 10:892.—This is a form of var. *Warscewiczii*.

13. **máxima**, Lindl. Plants about 1 ft. high: sepals and petals pink-lilac; labellum oval-oblong, obscurely 3-lobed, richly veined with crimson, expanded part crisped at the margin, a yellow median band on the disk. Equador. B.M. 4902. F.S. 20:2136. F.R. 1:298.

14. **Lawrenceàna**, Reichb. f. Pseudobulbs 12–15 in. high, frequently brownish, rarely green: sheath reddish brown: fls. few, about 4 in. across; petals oblong, blunt at the apices; sepals pale mauve, narrow; labellum purple shaded with maroon. March. British Guiana. B.M. 7133.

cc. *Number of fls. usually more than 6: pseudobulb 2–3-leaved.*

15. **Skinneri**, Batem. Stems about 1 ft. high, attenuated at base, 2-lvd.: fls. 6–8, sometimes more, about 4 in. across, rose-mauve; disk of labellum whitish, bordered with deeper rose-mauve or deep purple. Guatemala. B.M. 4270. P.M. 11:193. R.B. 22:201. G.C. III. 20:6. G.F. 3:201.—Common, and a favorite. Runs into white-fld. forms.

16. **Bowringeàna**, Veitch (*C. autumnàlis*, Hort.). Pseudobulbs about 18 in. tall, ½in. in diam., subcylindrical, jointed, nodes about 6, base swollen, 2–3-lvd.: fls. 5–30, on stout peduncles 1 ft. long, double-sheathed; petals 1½ in. long, deep rose-mauve; labellum magenta-purple at distal end, deeper colored toward sulfurous yellow throat. Blooms in autumn. Honduras. R.B. 21:37. R.H. 1890:300.—Undoubtedly a variety of the preceding.

BB. *Fls. not membranaceous, fleshy, thick: usually 2-leaved.*

C. *Peduncles pendent.*

17. **citrina**, Lindl. Pseudobulbs ovoid, not erect, with membranaceous whitish sheaths: lf.-blades glaucous, about 6 in. long: fls. never-fully expanding; sepals and petals very thick, lemon-yellow; labellum yellow, anterior margin crisped and white. Mex., at high elevations. B.M. 3742. J.H. III. 30:399.—Not an especially easy orchid to grow. Fragrant.

387. Cattleya labiata, var. Sanderiana.

cc. *Peduncles erect.*

D. *Lateral lobes of labellum practically wanting.*

18. **Aclándiæ**, Lindl. Dwarf: sts. slender, 4 in. tall: lvs. elliptical: peduncle 1–2-fld.: fls. about 4 in. across; sepals and petals nearly equal, oblong, yellowish verging on green, spotted and blotched with dark purple (much less distinct on dorsal surface); labellum with small lateral lobes that do not include the column, pale purple, with dark veins and a yellow line under the fleshy column. Brazil. B.M. 5039.

19. **bicolor**, Lindl. Sts. nearly 3 ft. high, 2-lvd.: lvs. oblong-lanceolate, about 6 in. long: peduncle 2–5-fld., sometimes more: fls. 4 in. across; petals and sepals greenish brown, sometimes spotted with brown; labellum tongue-shaped, crimson or deep rose-mauve, margins recurved; lateral lobes do not cover the column. Brazil. B.M. 4909.

DD. *Laterat lobes of labellum inclosing column.*

20. **Victória-Regìna**, O'Brien. Pseudobulbs slightly clavate: lvs. elliptical-oblong: peduncle short, 2–3- or more fld.: sepals oblong-lanceolate, obtuse, inferior ones tinged with yellow at the base, otherwise pink-lilac; petals undulate, similar to the sepals in color; labellum 3-lobed, lateral lobes whitish, with purple-violet blotch near summit, midlobe rounded on distal margin, crimson; disk yellow, striated with crimson. Pernambuco, 1891.—A hybrid between *C. labiata* and *C. Leopoldi*, var. *Pernambucensis*. One peculiarity that tends to show this origin is the variability in the number of leaves, sometimes 1, sometimes 2 being borne on a stem.

21. **intermèdia**, Graham (*C. amethýstina*, Morr.). Pseudobulbs 18 in. high, jointed, rarely 3-lvd.: lvs. narrowly ovate, serrulate on basal margins: fls. white, suffused with pale rose-lilac: labellum distinctly 3-lobed; throat whitish streaked with crimson-magenta, midlobe rather narrow, crimson-magenta. Rio de Janeiro. B.M. 2851. P.M. 1:151.—Var. **punctatissima**, Sander, is similar to the type, but the petals and sepals are peppered unevenly with crimson spots of various sizes. Var. **Parthènia**, Reichb. f., is white throughout. Brazil, 1886.

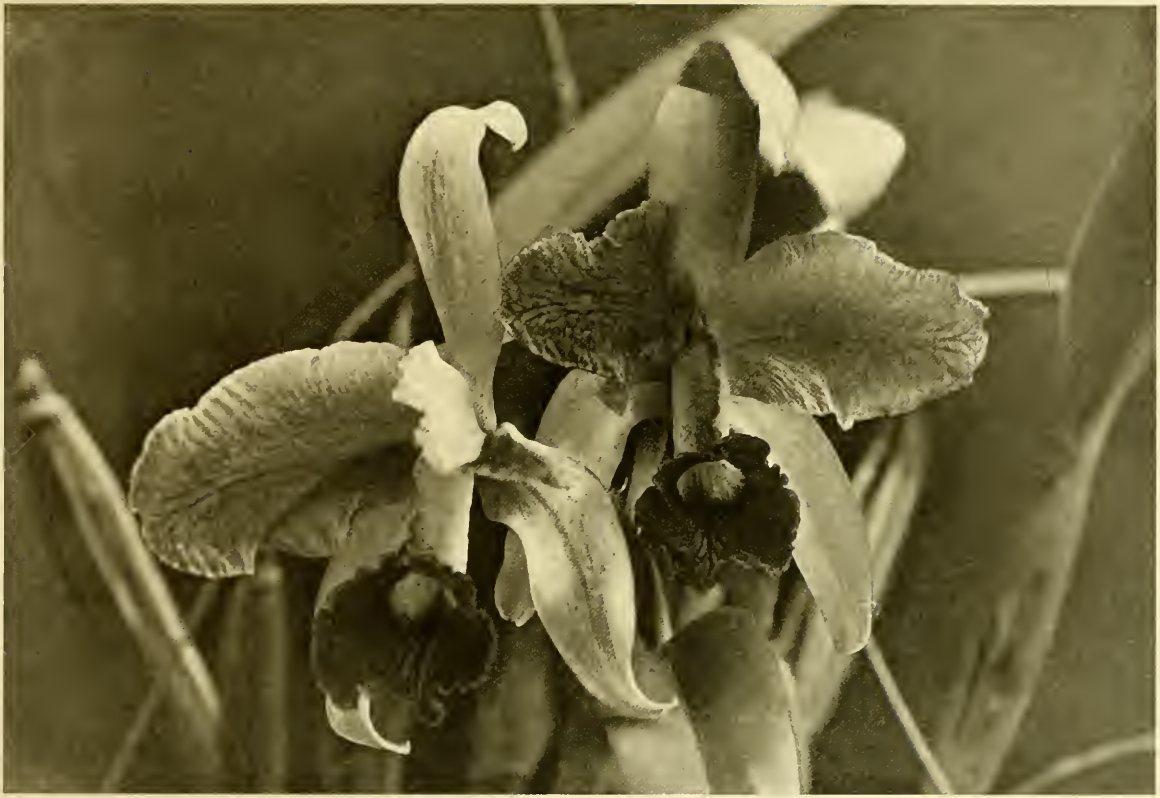
22. **Fórbesii**, Lindl. Fls. about 5; sepals oblong, obtuse, pale greenish yellow; petals oblong-lanceolate, undulate, same color: labellum trilobed, lateral lobes pale yellow without, brighter yellow within; the midlobe rather dentate, pale yellow; the disk brighter yellow, spotted with reddish purple toward the base. Braz. B.M. 3265.

23. **Lóddigesii**, Lindl. (*C. cándida*, Williams). Pseudobulbs about 1 ft. high: lf.-blades ovate, 5 in. long: fls. 2–4, pale pink-lilac; sepals elliptic-oblong; petals very similar; labellum 3-lobed, throat and inner surface of lateral lobes whitish, colored on the outside like the petals, the midlobe colored like the petals, spreading, base yellowish: column closely pressed to the labellum. Brazil.—This Cattleya was formerly called *Epidendrum violaceum*, and as an horticultural species is much older than *C. labiata*, which is often considered the oldest species in the group.

Var. **Harrisoniàna**, Hort. (*C. Harrisoniàna*, Batem. *C. Hárrisoniæ*, Paxt.). Surface of the labellum more corrugated. Really too like the preceding even to be a variety. P.M. 4:247. Gn. 48:1040.

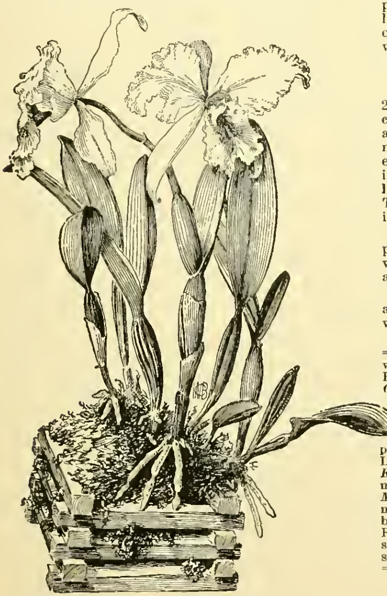
24. **guttàta**, Lindl. Pseudobulbs fusiform, 2–3-lvd.; lf.-blades elliptic-oblong: peduncle stout, bearing several large fls.; sepals oblong-lanceolate; petals rather broader, all yellowish green (metallic), spotted with brown-purple; labellum 3-lobed, lateral lobes pink-lilac, midlobe large, cuneiform, deeper colored. Rio de Janeiro. Var. **Lèopoldi**, Hort. (*C. Lèopoldii*, Versch. & Lem.), has smaller and more numerous fls. I.H. 2:69.

25. **amethystoglóssa**, Linden & Reichb. f. (*C. guttàta*, var. *Prínzii*, Reichb. f. *C. Prínzii*, Hort. *C. guttàta*,



Cattleya Lawrenceana

var. *Keteleèrii*, Houlbt.). Lvs. oblong-lanceolate: racemes many-fld.: petals and sepals about equal, the former obovate, the latter narrower, all suffused with rose and spotted with deep crimson; labellum 3-lobed, lateral lobes white outside, the reflexed apices crimson, midlobe broad, deep crimson, disk corrugated and papillose. Bahia, Brazil. B.M. 5683. R.H. 1869:210.



388. Cattleya labiata, var. Trianæi.

26. **granulòsa**, Lindl. Foliage very similar to that of the preceding species: peduncles stout, bearing several large fls.: sepals oblong, olive-green, spotted with red; petals obovate-oblong, undulate, margined, otherwise like sepals; labellum 3-lobed, lateral lobes yellow inside, whitish outside, midlobe attenuated toward the disk, expanded part subreniform, white, covered with numerous purple papillæ. Guatemala.

27. **Schofieldiàna**, Reichb. f. Lvs. 2, dark green, 6 in. long and 2 in. wide: sepals and petals light greenish yellow, the petals very narrow at the base and very broad and blunt at the top; lip much like that of *C. granulosa*, the side laciniæ whitish, the middle laciniæ purple-amethyst. Brazil. G.C. III. 22:252.—Fls. larger than in *C. granulosa*, and the lip is granulated.

28. **supérba**, Lindl. (*C. violàcea*, Hort.). Sts. clavate, about 1 ft. high: lvs. ovate-oblong, very thick: fls. about 6, 5 in. across; sepals and petals oblong-lanceolate, about equal, deep rose color, pale at the base; labellum 3-lobed, lateral lobes deep, rich crimson outside; midlobe broadly margined with same color, passing abruply into yellow, veined with crimson British Guiana. B.M. 4083. P.M. 9:265. J.H. III. 31:321. A.F. 11:1351.—This plant is reputed difficult to grow. There is a form called var. **spléndens**, Hort. It is paler in color than the type.

29. **Schilleriàna**, Reichb. f. Sts. 5 or 6 in. high, reddish brown, 2-lvd.: lvs. elliptical, dark above, brownish purple beneath: peduncles usually 2-fld.: fls. several in. across; petals and sepals equal, oblong-lanceolate, purple-brown, spotted with deeper brown: labellum 3-lobed, lateral lobes infolding the column, whitish without, yellow veined with purple within; midlobe reniform, deep rose-mauve with whitish veins, throat yellow. Braz. B.M. 5150. F.S. 22:2286. A.F. 6:563.

30. **lutèola**, Lindl. (*C. Hólfordi*, Hort.). Lf. 1, short and broad (3 in. long), the pseudobulb compressed: peduncle short, 5–6- or more-fld.: fls. very small, yellow, the sepals and petals uniform and 1–2-in. long and obtuse; lip about as long as the petals, 3-lobed, velvety within. Brazil. B.M. 5032. F.S. 23:2479.

AA. *Blossoms from a leafless pseudobulb.*

31. **Walkeriàna**, Gardner (*C. bulbòsa*, Lindl.). Stems 2–5 in. tall, 1–2-lvd.: lvs. oblong, 3–5 in. long; peduncles come from the rhizome near the base of the folia-stems, and are leafless; fls. large, 1 or 2; petals and sepals rosy mauve or pink-lilac; labellum 3-lobed, lateral lobes erect, partially infolding the column, midlobe spreading, anterior end deeper rose-mauve; posterior end yellowish, striated with rose-mauve. Braz. A.G. 11:159.—This Cattleya is distinct from all others in producing its fls. from a leafless shoot.

Var. **dolòsa**, Veitch (*C. dolòsa*, Reichb. f.). Peduncles produced from between two lvs. This variety, together with several others, must be regarded as perpetuated anomalies of *C. Walkeriana*.

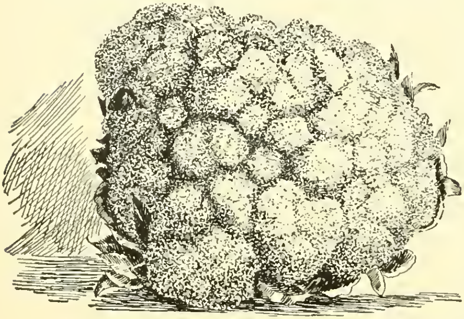
Var. **nobilior**, Veitch (*C. nobílior*, Reichb. f.). Large and handsome: front lobe of lip spotted with creamy white. I.H. 30:485.

Some of the hybrid Cattleyas are the following: *C. Albertii* =intermedia × superba; *C. Ballantiàna*=Trianæi × Warscewiczii: *C. Brabántiæ*=Loddigesii×Aclandiæ; *C. Brymeriàna*, Reichb. f.=supposed natural hybrid of superba×Eldorado; *C. Cassándra*=Loddigesii×Lælia elegans; *C. Chamberlainiàna* =Leopoldii×Dowiana; *C. Dormaniàna*=Lælia pumila× Cattleya bicolor?; *C. Exoniènsis*, Veitch (Lælia Exoniensis) =supposed natural hybrid of C. Mossiæ×Lælia purpurata; *C. faùsta*=Loddigesii×Exoniensis; *C. Hardyàna*, doubtful parentage, probably=Dowiana×gigas (F.R. 1:78); *C. Hárrisii*= Leopoldii×Mendellii; *C. hỳbrida picta*=guttata×intermedia; *C. Krameriàna*, Reichb. f., is a supposed natural hybrid of intermedia×Forbesii; *C. Lowryàna*=intermedia × Forbesii?; *C. Mánglesii*=Lnddemanniana×Loddigesii; *C. Márdelli*=Luddemanniana ×Lœlia elegans; *C. Márstersoniæ*=Loddigesii×labiata; *C. Meásuresii*=Aclandiæ × Walkeriana; *C. velùtina*, Reichb. f., is probably a hybrid with bicolor and some other species (Gt. 44:1420. G.C. III. 24:333); *C. Whìtei*, Reichb. f., a supposed natural hybrid of labiata×Schilleriana? *C. Zenòbia* =Loddigesii×Lælia elegans.

OAKES AMES.

CAULIFLOWER (*Brássica oleràcea*, Linn., var. *botrỳtis*, DC.). One of the cabbage tribe, of which the head is composed of the metamorphosed flowers and flower-cluster (Fig. 389). (See *Cabbage*.) The Cauliflower is one of those crops in the culture of which the unskilled amateur is liable to stumble upon success, and the more experienced professional to meet with failure. One can undertake to grow this crop intelligently and with some assurance of a favorable outcome only when he thoroughly understands the particular requirements of this fastidious vegetable. These requirements mean especially a high degree of soil fertility, perpetual moisture with proper drainage, and protection from an excess of direct sun heat. In the heat of mid-season, Cauliflowers seldom head well, except in more than ordinarily favorable locations or seasons. For this reason, the early crop is usually expected to head before midsummer, while the late crop is planted with the expectation to have it come to a head after the hottest summer weather is over. In all cases, try to select the richest land for Cauliflower, giving a rich pasture or clover-field the preference. A strong loam, neither too clayey nor too sandy, is best. Plenty of good manure, horse manure being considered best, must be well incorporated with the soil, and the latter be brought into the highest state of tilth.

For the early crop, start the plants from best seed obtainable, under glass, as early as the early cabbage plants are started. This can be done in a greenhouse or a hotbed. The possessor of the greenhouse, of course, has the advantage that he is sure to be in position to plant, and that no postponement will be necessary on account of the weather. The aim is to have the seedlings pricked out into a coldframe and grown to good transplanting size, and also well hardened off by exposure, by the time that the soil can be brought into good working order in early spring. With properly hardened plants, late spring frosts are not much to be feared. Liberal applications of good commercial fertilizers, say up to a ton per acre, and made either before or after the plants are set, are often of material help; and an ounce or two of nitrate of soda scattered around each plant soon after setting seldom fails to show marked or even remarkable results. Salt, lime, kainit, or muriate of potash frequently tend to aid the plants in making increased growth. No application, however, can be more necessary or more useful than that of cultivator and hoe. The soil at all times should be kept loose and mellow.


389. Cauliflower, trimmed for market.

The best demand for Cauliflower is usually during the pickling season, in September and October. Plants can be started from seed and transplanted to the field at the same time that we start and set late cabbage plants, or a little later. In a general way, the crop is handled similarly to the early crop. It is not always an easy task, however, to get the plantation started during the hot and dry weather of July. A favorite method of raising late Cauliflower is to sow a few seeds right in the hill where the plants are wanted to grow. Put the soil in perfect tilth previously, then mark out rows 3 feet apart, drop the little pinches of seed about 2 or 2½ feet apart in these shallow marks, and lightly cover with the foot, firming well by stepping on each hill. Later on the plants are thinned to one in the hill. The soil must be kept stirred frequently, unless—and this is a much better plan, and one which we always try to practice—the soil is kept well covered with a mulch of fresh manure, thick enough to keep down all weed growth. In dry weather, water may be poured upon this layer of manure, and will furnish both food and drink for the plants.

Of the enemies of the crop, none is more formidable than the cabbage root-maggot. This seems to have a special liking for the Cauliflower. The protective measures which are used for early cabbages are all the more necessary for early Cauliflower. Among such measures, that of enveloping each plant with a tight-fitting collar of tarred felt, and the other of injecting about a teaspoonful of bisulfide of carbon into the soil under the roots of each plant, are probably the best and most surely effective. Plant lice are another serious pest of this crop. Effective remedies are dusting with fine tobacco dust, or spraying with strong tobacco tea or kerosene emulsion. At times we have had fair success by dashing hot soap-suds upon the plants.

VARIETIES.—There are no typical or very marked differences between any of our most popular varieties. Most of them are selected strains of the Early or Earliest Dwarf Erfurt. Among these are Alabaster, Best Early, Gilt Edge, Ideal, Lackawanna, La Crosse Favorite, Long Island Beauty, Sea Foam, Snowball, Snowstorm, and others. All these may be planted for early as well as the late crop. A large form of the Early Erfurt (and a little later) seems to be slightly better adapted to growing in warm weather. Early Paris and Half-early Paris are varieties well suited to summer conditions. Autumn Giant or Giant Naples is a rather late sort, which gives good satisfaction in some of our coast states.

The hot summers of the United States are not favorable for the production of Cauliflower seed, so that, until quite recently, almost every pound of seed used here was imported from Europe. Now, however, a considerable portion of it is being grown on the Pacific coast (Puget sound), and seems superior to the imported in plumpness and vitality. We have always secured especially strong plants from this American-grown seed. For seed-growing purposes, sow seed during July, transplant, and winter the partially-developed heads over in coldframe or cellar, to be set in open ground again in early spring, and otherwise to be handled similarly to early cabbage when grown for seed.

T. GREINER.

CAVAN is *Acacia Cavenia.*

CEANÒTHUS (ancient Greek name). NEW JERSEY TEA. *Rhamnàceæ.* Shrubs or rarely small trees, sometimes spiny: lvs. alternate, sometimes opposite, serrate or entire, and usually 3-nerved at the base: fls. perfect, 5-merous, white, blue or purplish, small, but in showy, often panicled clusters: fr. a 3-celled drupe, dry at length and separating into 3 stones. Thirty-six species in N. America, chiefly Pacific coast region. Ornamental, free-flowering shrubs, some especially valuable for their late flowering period. Many of them are only hardy in the warmer temperate regions, but *C. Americanus*, *C. ovatus*, and *C. Fendleri* are hardy north, while the numerous hybrids of *C. Americanus* are only half hardy, and even if protected they are killed to the ground in the north, but the young shoots will usually flower the same season. The safest way, however, to have good, free-flowering plants of these beautiful hybrids will be, in the north, to dig them up in fall, store them away in a frost-proof pit or cellar, and to plant them out again in spring. Pruning of the late flowering species will be of advantage; about one-half of last year's growth may be taken away. They grow in almost any soil, but best in a light and well drained one, and most of the Californian species prefer a sunny position. Prop. by seeds sown in spring and by cuttings of mature wood in autumn, inserted in a coldframe or greenhouse; softwood cuttings also grow readily if taken in early spring from forced plants. Sometimes increased by layers, and the varieties and hybrids by grafting on roots of *C. Americanus* under glass in early spring; the cions must be fresh and with leaves, taken from plants kept in the greenhouse during the winter.

A. *Lvs. alternate.*

B. *Margins of lvs. serrate or crenate.*

C. *Fls. white.*

D. *Foliage deciduous.*

Americànus, Linn. Fig. 390. Low, erect shrub, to 3 ft.; lvs. ovate, usually acute, finely and irregularly serrate, bright green and dull above, paler and pubescent or nearly glabrous beneath, 1½–3 in. long: fls. in terminal and axillary panicles on slender peduncles, forming large, corymbose panicles. July–Sept. From Canada to S. Carolina and Texas. B.M. 1479.—Common in dry woods and making a profusion of bloom, which, however, is short-lived. Many hybrids have been raised from this species in Eu. (see *C. hybridus*). Var. **intermèdius,** Trel. (*C. intermèdius*, Pursh), has smaller, ovate or ovate-lanceolate lvs. and the fls. in small, very slender, peduncled, short racemes or panicles. Tennessee to S. Carolina.

ovàtus, Desf. (*C. ovàlis*, Bigel.). Low shrub: lvs. elliptic to elliptic-lanceolate, obtuse or acute, crenulate-serrate, nearly glabrous, glossy above, 1–2 in. long: inflorescence like the former, but usually smaller. New England to Colorado and Alabama.

sanguineus, Pursh (*C. Oregànus*, Nutt.). Tall shrub, with purple or reddish glabrous branches: lvs. orbicular to ovate or obovate, obtuse, serrate, nearly glabrous, 1–3 in. long: fls. in rather long, narrow panicles, on stout, leafless peduncles, axillary, from branches of the previous year. May, June. Brit. Columbia to Calif. B.M. 5177.

DD. *Foliage persistent, shining above, canescent beneath.*

velùtinus, Dougl. Tall shrub: lvs. broadly elliptic, mostly subcordate, obtuse, serrate, dark green and glabrous above, 2–3 in. long: fls. in large, compound panicles at the ends of the branches. June, July. Brit. Columbia to Colo. and Calif. B.M. 5165.

CC. *Fls. blue, purplish or pink: lvs. half evergreen.*

hirsùtus, Nutt. Shrub or small tree, with villous branches: lvs. broadly elliptic or ovate, rounded or cordate at the base, obtuse or acute, with glandular teeth, villous and usually green beneath, ½–2 in. long: fls. deep blue to purplish, in narrow panicles, 1–2 in. long. April, May. Calif.—Var. **Órcutti**, Trel. (*C. Órcutti*, Torrey). Fls. blue, paler: fr. loosely villous.

thyrsiflòrus, Eschsch. Shrub or small tree: lvs. oblong, obtuse, crenate-serrate, nearly glabrous, 1–1½in. long: fls. blue, rarely white, in narrow panicles, about 3 in. long. May–July. Oregon to Calif. B.R. 30:38. S.S. 2:64. G.C. III, 20:363.—A very fine, free-flowering species of beautiful blue color. Probably natural hybrids of this species are: *C. Veitchiànus*, Hook. (*C. thyrsiflorus × rigidus*), with deep blue fls. in dense panicled clusters; B.M. 5127; F.S. 13:1383, and *C. Lobbiànus*, Hook. (*C. thyrsiflorus × dentatus*), with deep blue fls., in oval, peduncled, solitary clusters. B.M. 4810 (4811 by error). F.S. 10:1016.

390. Ceanothus Americanus (× ⅓).

hýbridus, Hort. Hybrids of garden origin, chiefly between *C. Americanus* or *C. ovatus* and *C. thyrsiflorus* or *C. azureus*, mostly raised in French nurseries. Some of the most distinct are: *Álbus-plènus*, with double white fls.; *Atrocærùleus purpùreus*, fls. blue, foliage purple when young; *Arnoldi*, fls. sky-blue, in large panicles; *Gloire de Versailles*, with bright blue, large panicles; *Gloire de Plantières*, fls. dark blue, in large panicles; *Marie Simon*, fls. flesh-colored; *Ròseus*, fls. pink. R.H. 1875:30.

BB. *Margins of lvs. entire or nearly so: half evergreen.*

Féndleri, Gray. Low, prostrate and spiny shrub: lvs. oval, rounded or nearly acute at both ends, entire, rarely finely serrulate, grayish green, minutely tomentose beneath, ½–1 in. long: fls. white, in short racemes, terminal, on short, lateral branchlets. June, July. From S. Dakota to New Mexico and Arizona.—A very graceful and free-flowering shrub of almost creeping habit, well adapted for covering dry, sandy banks; half evergreen and hardy north.

integérrimus, Hook. & Arn. Tall, erect shrub, with glabrescent branches: lvs. broadly elliptic or ovate, sparingly hairy or glabrous, bright green beneath, 1–3 in. long: fls. blue, sometimes white, fragrant, in 3–6-in. long, narrow panicles. April–June. Washington to Calif. and S. E. Arizona.

divaricàtus, Nutt. Tall, erect shrub, with usually glaucous branches and often spiny: lvs. ovate, obtuse or nearly acute, glaucous and glabrous or grayish tomentose, ⅓–1 in. long: fls. pale blue, sometimes whitish, in 2–3-in. long, narrow panicles. April–June. Calif.

AA. *Lvs. opposite, persistent.*

cuneàtus, Nutt. Tall, much-branched shrub: lvs. spatulate or cuneate-obovate, mostly obtuse, entire, minutely tomentose beneath, ¼–1 in. long: fls. white, in small clusters along the branches. March–May. Oregon to Calif. B.H. 8:170.

prostràtus, Benth. Procumbent shrub: lvs. cuneate, obovate or spatulate, coarsely and pungently toothed, sometimes only 3-pointed at the apex, often minutely silky when young, ½–1 in. long: fls. blue, in clusters, terminal on short branchlets. Spring. Washington to Calif.

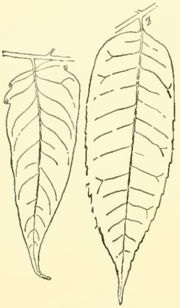
C. Africànus, Linn.=Noltea Africana.—*C. atrocærùleus purpùreus*, see C. hybridus.—*C. azùreus*, Desf. Low shrub: lvs. membranaceous, oblong, serrate, pubescent: fls. blue, in large panicles. Summer. Mexico. L.B.C. 2:110. B.R. 4:291. P.M. 2:74. Under this name a hybrid of this species with C. Americanus is often cultivated.—*C. bícolor*, HBK.=C. azureus.—*C. cærùleus*, Lag.=C. azureus.—*C. dentàtus*, Torr. & Gray. Low shrub: lvs. oblong, penninerved, dentate, glandular-papillate above, loosely hairy: fls. blue, in peduncled clusters. Calif. F.S. 6:567, 2. B.H. 3:101.—*C. dentàtus*, var. *floribúndus*. Trel. (C. floribundus, Hook.). Fl.-clusters numerous, nearly sessile: lvs. smaller. B.M. 4806. F.S. 10:977. I.H. 7:238. B.H. 5:129. *C. foliòsus*, Parry. Low shrub: lvs. small, broadly elliptic, glandular-toothed, slightly hairy, pale or glaucous beneath: fls. deep blue, in numerous small clusters. Calif.—*C. intermèdius*, Pursh=C. Americanus, var. intermedius.—*C. lævigàtus*, Dougl. Tall shrub: lvs. broadly elliptic, serrate, glabrous, glaucous beneath: fls. yellowish white, in large panicles. Calif.—*C. Lobbiànus*, Hook., see C. thyrsiflorus.—*C. microphýllus*, Michx. Low shrub: lvs. very small, obovate or elliptic, nearly glabrous: fls. white, in small, short-peduncled clusters. Florida.—*C. Oregànus*, Nutt.=C. sanguineus.—*C. Orcutti*, Parry=C. hirsutus, var. Orcutti.—*C. papillòsus*, Torr. & Gray. Low shrub: lvs. narrow-oblong, dentate, glandular-papillate above, villous beneath: fls. deep blue, in peduncled, axillary oblong clusters. Calif. B.M. 4815. F.S. 6:567, 1. P.F.G. 1. p. 74. R.H. 1850:321.—*C. Pàrryi*, Trel. Large shrub: lvs. elliptic or ovate, denticulate, cobwebby beneath: fls. deep blue, in peduncled, narrow panicles. Calif.—*C. rígidus*, Nutt. Rigid, much-branched shrub: lvs. opposite, cuneate-obovate, denticulate, usually glabrous, small: fls. blue, in small, nearly sessile, axillary clusters. Calif. B.M. 4660 (as C. verrucosus) and 4664.—*C. Veitchiànus*, Hook., see C. thyrsiflorus.—*C. verrucòsus*, Nutt. Low shrub: lvs. mostly alternate, roundish obovate, emarginate, denticulate, nearly glabrous, small: fls. white, in small, axillary clusters along the branches. Calif.—*C. verrucòsus*, Hook.=C. rigidus.

ALFRED REHDER.

CEDRÉLA (from *Cedrus*, the wood resembling that of Cedrus). *Meliàceæ.* Tall trees, with alternate, usually abruptly pinnate lvs., without stipules; lfts. petioled, entire or slightly serrate: fls. inconspicuous, whitish, usually perfect, 5-merous, in large, pendulous, terminal panicles; the 5 petals forming a tube with spreading limb: fr. a capsule, dehiscent, with 5 teeth, with many flat, winged seeds. Eight species in trop. Amer. and 8, forming the subgenus Toona, in E. India and Australia. Tall, ornamental trees, and well adapted for avenues; only hardy in S. Calif. and in the Gulf states, except *C. Sinensis*. The wood of some species is known as cedar wood, and much valued for making furniture and boxes. They thrive best in rich loam, and are prop. by seeds or by cuttings of mature wood, and, also, by root-cuttings, all with bottom heat.

A. *Lfts. 10–25, quite glabrous.*

Sinénsis, Juss. Fig. 391. Tree, to 50 ft.: lvs. long-petioled, 10–20 in. long; lfts. 10–22, oblong or oblong-lanceolate, acuminate, slightly and remotely serrate, 4–8 in. long: fls. white, in very long, pendulous racemes: fr. oblong or obovate, about 1 in. long. June. China. R.H. 1891, p. 574–75, and 1875, p. 87. Gng. 4: 1.—Ornamental tree, with large, feathery foliage; very valuable for avenues; similar to Ailanthus, and nearly of the same hardiness, but of more regular and dense growth, and without the disagreeable odor when flowering. Ailanthus can be easily distinguished by the few coarse teeth near the base of the lfts., each bearing a large gland beneath (Fig. 391).



391. Leaflets of Cedrela and Ailanthus.
Cedrela on the right (× ⅓).

serràta, Royle. Tree, to 70 ft.: lvs. usually odd-pinnate, 15–20 in. long; lfts. 15–25, ovate-lanceolate or ovate-acuminate, irregularly serrate, glaucous beneath: panicles long, pendulous: fls. fragrant. Himalayas.—This is probably the hardiest of the tropical species. Closely allied to this species is *C. Toona*, Roxb., from E. India, but lvs. abruptly pinnate, and lfts. usually entire.

odoràta, Linn. Tree, to 80 ft.: lvs. 10–20 in. long; lfts. 12–20, ovate-lanceolate, acuminate, nearly entire, 4–6 in. long: panicles shorter than the lvs.: fr. oblong, almost 1½ in. long. W. India.—The cedar wood comes mostly from this species.

AA. *Lfts. 6–10, finely ciliate.*

Dugèsi, Wats. Tree: lvs. 10–15 in. long; lfts. cuneate, ovate-lanceolate, long and slender acuminate, nearly entire, shining above, 4–6 in. long: panicles rather compact, much shorter than the lvs. Mexico.

ALFRED REHDER.

CEDRONÉLLA (*a little Cedar*, from the odor of *C. triphylla*, a species from the Canary Islands, sometimes called "Balm of Gilead"). *Labiàtæ*. Eight species of herbs or shrubs, allied to Dracocephalum. The two native kinds described below are compact, free-flowering border perennials, with aromatic lvs. and numerous showy, purplish pink fls. with blue stamens, and borne in dense whorls on long racemes or spikes. They are not quite hardy north, and should have a sheltered, sunny position, or some winter protection.

càna, Hook. Height 2½–3 ft.: stems hard, square, subshrubby: branches numerous, especially at the base, opposite, hoary with a minute pubescence: upper lvs. small, ½–1½ in. long, entire, hoary, numerous near the fls., ovate; lower lvs. larger, cordate-ovate, dentate-serrate: spikes numerous: whorls dense, 15 or more fld.: corolla 1 in. long, limb 5-cleft, the lowest lobe largest, crenate, revolute. June–Oct. Mex. and N. Mex.

Mexicàna, Benth. (*Gardòquia betonicoìdes*, Lindl.). Height 1–3 ft.: root creeping: lvs. 1½–2½ in. long, ovate-lanceolate (the lower ones cordate), crenate-dentate, becoming purplish below, petioled: fls. very like above, bright pink. Mex., Mts. S. Ariz. B.M. 3860.—Rarer in cult. than above. Lvs. larger, longer and fewer.

triphýlla, Mœnch (*Dracocéphalum Canariénse*, Linn.). BALM OF GILEAD. Shrubby: leaflets 3, oblong or lanceolate: fls. purple or white, in loose spicate whorls. Aromatic plant from Canary Is. Three to 4 ft.

J. B. KELLER and W. M.

CÈDRUS (*Kedros*, ancient Greek name). *Coníferæ.* CEDAR. Large evergreen trees, with quadrangular, stiff, fasciculate lvs.: fls. monœcious, forming cylindrical catkins: cones ovate, 3–5 in. long, with broad, closely imbricate bracts, attaining maturity in two or three years; seeds winged. Three closely allied species in N. Africa, Asia Minor and Himalayas. Large ornamental Conifers, with wide-spreading branches, very distinct in habit from most other Conifers; not hardy north, but the hardiest, *C. Atlantica*, may be grown as far north as New York in sheltered positions, while *C. Deodara* can be only grown safely in Calif. and S. states. The very durable and fragrant wood of all species is highly valued. The Cedars prefer well-drained, loamy soil, and will also grow in sandy clay, if there is no stagnant moisture. Prop. by seeds, sown in spring; the varieties by veneer grafting, in late summer or in fall, on seedlings of *C. Atlantica;* or, in warmer regions, on *C. Deodara;* they grow also from cuttings, if the small shoots are selected which spring occasionally from the old wood. Plants of this genus are the true Cedars; but trees of other genera are often called Cedar. See *Chamæcyparis, Juniperus*, and *Thuya;* also *Cedrela.*

A. *Branches stiff, not drooping: cones truncate, and often concave at the apex.*

Atlántica, Manetti. Fig. 392. Large, pyramidal tree, to 120 ft., with upright leading shoots: lvs. mostly less than 1 in. long, usually thicker than broad, rigid, glaucous-green: cones 2–3 in. long, light brown. N. Africa. Gng. 2: 163. G.F. 9: 417. R.H. 1890, p. 32. Var. **glaùca**, Hort. Foliage glaucous, with silvery hue; a very desirable and vigorous form. Var. **fastigiàta**, Carr. Of upright columnar habit. R.H. 1890, p. 32.

Libàni, Barr. Large tree, with wide spreading, horizontal branches, forming a broad head when older, leading shoot nodding: lvs. 1 in. or longer, broader than thick, dark or bright green, sometimes bluish or silvery: cones 3–4 in. long, brown. Lebanon, Taurus, S. Anatolia and N. Africa. Gng. 5: 65. Mn. 1: 39. G.F. 8: 335. Gn. 48, p. 237. Var. **argéntea**, Loud. With blue or silvery hue. Var. **nàna**, Loud. Dwarf form.

392. Cedrus Atlantica.

AA. *Branches and leading shoot pendulous: cones obtuse.*

Deodàra, Loud. Tall tree, of pyramidal habit, to 150 ft.: lvs. 1–2 in. long, dark bluish green, rigid, as thick as broad: cones 3½–5 in. long, reddish brown. Himal.

Gng. 2:8. Var. **argéntea**, Hort. Lvs. with silvery hue. Var. **víridis**, Hort. Lvs. bright green. Var. **robústa**, Hort. Lvs. about 2 in. long, very rigid.

Alfred Rehder.

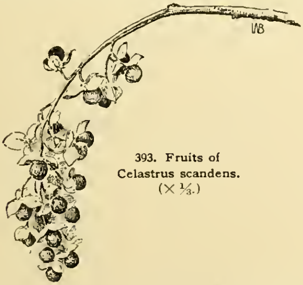
CEIBA. See *Eriodendron.*

CELANDINE. See *Chelidonium.*

CELÁSTRUS (*Kelastros*, ancient Greek name). *Celastràceæ.* Shrubs, usually climbing, with alternate, petioled, usually deciduous and serrate glabrous lvs.: fls. polygamous, 5-merous, inconspicuous, greenish white, in axillary or terminal panicles or racemes: fr. a capsule, dehiscent into 3 valves, each containing 1 or 2 seeds, enclosed in a fleshy crimson aril. About 26 species in S. and E. Asia, Australia and America. Hardy ornamental shrubs, very effective by their bright-colored fruit remaining usually throughout the winter; they are very valuable for covering trellis-work, trees or rocks and walls. They grow in almost any soil and situation, and as well in shaded as in sunny positions. Prop. by seeds, sown in fall or stratified, and by root-cuttings or layers; suckers are freely produced, and become sometimes a nuisance in nurseries; they can be also increased by cuttings of mature and of soft wood. The species with perfect fls. in axillary cymes and with evergreen lvs., being rigid and often spiny shrubs, are now included under *Gymnosporia*, which see.

scándens, Linn. False Bitter Sweet. Fig. 393. High, climbing to 20 ft.: lvs. cuneate, ovate to ovate-lanceolate, acuminate, crenate-serrate, glabrous, 2–4 in. long: fls. in terminal, many-fld. panicles or racemes: fr. about ½in. in diam., orange-yellow, with crimson seeds. Canada to S. Dakota and N. Mexico. Em. 545. A.G. 11:29, 31. G.F. 5:569. Gng. 5:119.

orbiculàtus, Thunbg. (*C. articulàtus*, Thunbg.). High climbing shrub: lvs. cuneate, suborbicular to oblong or obovate, acute or acuminate, crenate-serrate, 2–3 in. long: fr. globular, orange-yellow, with crimson seeds. Japan, China. B.M. 7599. G.F. 3:550. A.F. 9:534. G.C. III, 23:29. Gng. 5:119. Var. **punctàtus**, Rehder (*C. punctàtus*, Thunb.). A less vigorous grower, with smaller, elliptic lvs. *C. orbiculatus* is of more vigorous growth than the former species, and fruits very profusely, but the fruits are hidden by the foliage, and are not very conspicuous until the lvs. have fallen, while *C. scandens* bears its fruits above the lvs.



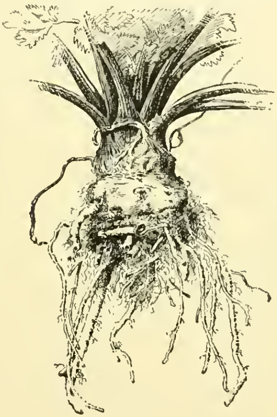
393. Fruits of Celastrus scandens. (× ⅓.)

paniculàtus, Willd. (*C. depéndens*, Wall.). Branches with white lenticels, pendulous: lvs. ovate-oblong or obovate: fls. in terminal pendulous panicles. Himalayas. Not hardy N.

C. nùtans, Hort. Reasoner, not Roxbg.=Quisqualis Indica.—*C. Orixa*, Sieb. & Zucc.=Orixa Japonica.

Alfred Rehder.

CELERIAC (*Apium gravèolens*, Linn., var. *rapàceum*, DC.). *Umbellíferæ.* Fig. 394. An offshoot of the celery species, producing an edible root instead of edible leaves. Just how long Celeriac, or Turnip-rooted Celery, has been in cultivation is unknown. Its history as a garden vegetable can be traced definitely as far back as the middle of the seventeenth century, although writers for a century or more previous to this time made references which would seem to relate to this vegetable, but the identity is obscure. Its origin was probably the same as that of the common garden celery, of which it is doubtless a state wherein the root has become enlarged and edible. This form is supposed to be the one most remotely removed from the wild state.



394. Celeriac (× ⅓).

Celeriac is very little grown in this country, and to Americans is almost unknown, but it is much prized in Europe. It is cultivated chiefly where there is a German population. Fifteen or 20 varieties are mentioned in the seed catalogues, but there is very little difference in the various sorts, some seedsmen even making no distinction between varieties, but catalogue the plant simply as Celeriac.

In general, the culture is the same as for celery, except that no blanching is required, since it is the enlarged root which constitutes the edible portion. Sow the seed during the spring in a well-prepared seed-bed, preferably in a more or less shaded location. A coldframe or a spent hotbed is a good place. The seed is slow to germinate, and must be kept well watered. When the plants are 2 or 3 inches tall, they ought to be transplanted; about 3 inches apart each way is a good distance to place them at this handling. Later, again transplant them to the open ground, in rows about 2 feet apart and 6 or 8 inches distant in the row. The soil should be a rich, light loam well supplied with moisture.

The seed may be sown where the plants are to remain, and thinned to the required distance, but stronger, more stocky plants are obtained by transplanting as above directed.

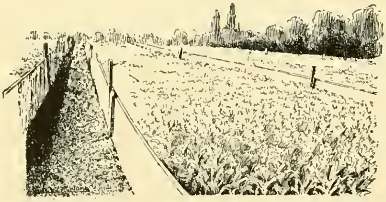
Plants thus treated will be ready for fall and winter use. If they are desired for earlier use, the seeds may be sown in a mild hotbed and transplanted to the open as soon as the ground is in good condition in the spring. Aside from frequent tillage, Celeriac requires but little attention during growth. It is a frequent practice among growers to remove a little of the earth from about the plants after the root has become well enlarged, and to cut off the lateral roots. This tends to make the main root grow larger, smoother and more symmetrical in shape.

For winter use, the plants may be protected with earth and straw sufficient to keep out frost, or packed in moist sand and placed in a cool cellar.

The principal use of Celeriac is for the flavoring of soups and stews, but it is also served in several other ways. It may be boiled and eaten with a white sauce, like cauliflower; as a salad, either first being cooked as beets or turnips, or else cut up into small pieces and used raw; when boiled, sliced and served with oil and vinegar, it forms the dish known as "celery salad." An extract may be obtained from it which is said to have certain medicinal properties. H. P. GOULD.

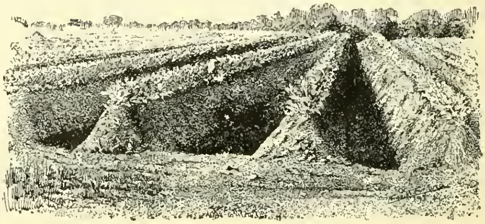
CELERY (*Apium gravèolens*, Linn.). *Umbelliferæ.* Annual or biennial plants: leaf-stalks 6–15 in. long, bearing 3 pairs and a terminal leaflet, all of which are coarsely serrate and more or less ternately lobed or divided: flower stalk 2–3 ft. high, branched and leafy, bearing numerous rather small compound umbels of inconspicuous white flowers: fruit small, flattened on the sides, broader than long. An ounce contains between 60,000 and 70,000 seeds.

Celery is known in America only as a garden vegetable, and is cultivated mainly for the leaf stalks, which are blanched and eaten raw with salt, made into salads, or boiled and served like asparagus. Celery roots, leaves and seeds are also used in flavoring soups, meats, etc. The garden form resembles wild celery, which grows over a wide range in Europe and Asia, but the plants are less acrid and pungent and the leaf-stalks are much larger and more meaty and solid. Ancient writers left little definite information about this plant, and it is doubtful if its cultivation as a staple garden vegetable really began until after the Middle Ages. Previous to that time it does not appear to have been clearly distinguished from parsley, which was mainly used at funeral ceremonies, and not at all as a salad plant. It is supposed that the *Selinon* mentioned by Homer in the Odyssey was wild celery, and it has also been stated that Dioscorides distinguished between the wild and the cultivated forms of this plant, but later writers were singularly silent about garden celery until the seventeenth century. In 1629 Parkinson wrote that "sellery" was a rarity in England. It seems to have been introduced there from Italy, where its cultivation as a garden vegetable probably began. In 1699 John Evelyn wrote of "sellery" as *Apium Italicum*, and described it as a hot and more generous form of Macedonian parsley or smallage, which, he stated, for its high and grateful taste was ever placed in the middle of the Grand Sallet at the great men's tables and Prætors' Feasts as the grace of the whole board. During the seventeenth and eighteenth centuries celery was frequently called *smallage* in England and *ache* in France, but now these names have fallen into disuse. Until about 1850 celery was grown in trenches; later level culture was gradually adopted. For 20 or 25 years following 1850 celery was used almost entirely as a winter vegetable. The plants were only partially blanched in the field, then lifted and placed in trenches or celery pits, where they remained until the blanching process was completed, being taken out from time to time during the winter. Celery is reported as naturalized on the coast of southern California, and as escaped from cultivation in southeastern Virginia.



395. Celery planted thick, and the patch edged with boards.

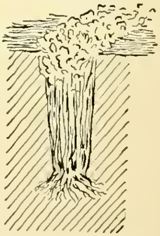
The demand for earlier celery increased after 1875 or 1880. The introduction of two new kinds of celery a few years later, namely the White Plume and the Paris Golden, both with distinct self-blanching tendencies, gave a fresh impetus to the cultivation and the consumption of early celery. These new kinds were more attractive as table decorations, and they were also more easily grown and blanched than any varieties previously cultivated. Soon after their introduction boards began to be used in the place of earth in blanching early celery. This proved a decided advantage to growers because the rows could be from 2½ to 3 feet apart instead of 4 or 5 feet, as was necessary before, and also less labor was required in caring for the crop and preparing it for market. With the new varieties and improved methods of blanching, early celery began to be grown on a large scale after 1885, and now large markets are supplied with Celery throughout the entire year.



396. The last earthing-up of Celery.

STARTING THE PLANTS.—Celery seed is usually sown in frames where there is but little artificial heat. The seeds germinate slowly, and the seedlings require about three months after the seed is planted to mature sufficiently to be set in the field. Sowings for the early crop begin in January, and those for the late crop about the middle of March in the northern states. The seed is sown broadcast, and when the plants are large enough to handle they are transplanted into other frames, being set 2 or 3 inches apart each way. The soil in these frames, and also where the seed is sown, is made very fertile, to insure a strong growth of both roots and foliage. After being transplanted the plants are allowed to remain in the frames only long enough to send out a new set of roots and leaves. If for any reason the plants remain in the frames too long, they often go to seed prematurely when set in the field. This is much more likely to occur with the early than with the late crops.

FIELD CULTURE.—Moist, peaty soil is preferred, but celery is successfully grown on clayey and even sandy soils, when these are highly fertilized and irrigated. Level culture is now generally practiced, the old method, in which plants were set in single or double rows in trenches (Fig. 397) being nearly obsolete. The plants are set from 6 inches to a foot apart in the rows, and the rows from 2½ to 3½ feet apart. Early and late varieties are often set in alternate rows. Boards are used to blanch the plants that mature first, and when these are out of the way there is room to bank the remaining rows with earth (Fig. 396).



397. The old method of growing Celery in trenches. Plants are sometimes stored for winter in such trenches.

Celery plants are also set 7 or 8 inches apart each way in beds. This method requires intensive culture. The plants must be frequently fertilized and copiously watered during their growth. In this case the crowding of the leaves is sufficient to blanch the stalks of the

Paris Golden, which is the variety generally grown in this way, and boards are used only around the outside of the beds (Fig. 395). This method is known as the "New Celery Culture," or Niven's method.

Blanching.—When the weather is warm in summer celery often blanches in two weeks after boards are set up beside the rows, but later in the fall it takes three or four weeks, and the winter varieties are often banked with earth considerably longer than this and then placed in celery pits, where the blanching process continues. Hemlock boards an inch thick, a foot wide and 12 feet long, are largely used for blanching summer celery. These are placed on edge beside the rows and drawn nearly together at the top, where they are held by small wooden cleats. When thus placed the boards enclose the entire plants, with the exception of ends of scattering leaves, which project above them. In market gardens these boards are moved from one field to another after the crops mature, and kept in constant use from the middle of June until late in November. When freezing weather is expected, the remaining plants of the early varieties are lifted and set in beds in the field, where they are enclosed on the sides and covered as closely as circumstances may require with the boards.

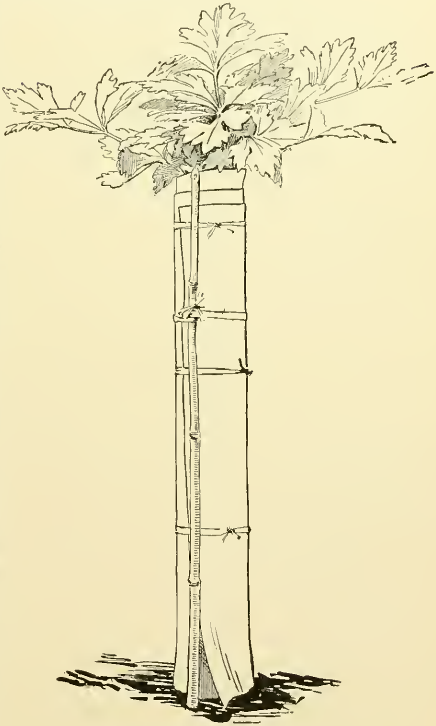
Late celery is blanched mainly by banking with earth, the earth being thrown up against the plants at two or three different times; first, the base of the bank is thrown up about one foot high, the leaves being held together during the operation to prevent the soil from filling in between the stalks. The top of this bank is left broad and dishing so that the plants can be watered. Two or three weeks later the bank is raised 8 inches or a foot higher, and often it is again raised, the top of the highest banks being about 3 feet above the ditches between the rows. The plow is used in loosening the soil, but the banking is mainly done by hand. The old method of growing celery in trenches (Fig. 397) in order to bleach it is now entirely obsolete in this country. A well-hilled field is shown in Fig. 396.

Celery is sometimes blanched by wrapping the plants in thick paper (Fig. 398), or by placing large pieces of drain tile over them.

Preparation for Market.—After pulling, the celery is trimmed, then taken to the packing room, where it is washed and tied in bunches, the bunches being from 3 to 4 inches in diameter and containing from 2 to 6 "heads" or plants. The root is cut to a point, as shown in Fig. 399. After bunching, it is packed in cases of various patterns which hold from 2 to 5 dozen bunches each. A common style of celery crate, for the marketing of trimmed plants, is shown in Fig. 400. Sometimes celery, especially the early crop and for nearby markets, is not trimmed at the roots; but the roots are left intact, the plant washed and stripped of its dead and broken leaves and then shipped in a tray which holds water. Fig. 401 shows Niven's tray, used for this purpose. This tray or crate will hold 24–30 roots. The sides, A A, are 20x40 in.; B B, 14½x40 in.; top pieces, C, 1½in. wide by ⅝in. thick; posts, D, 1x1x12 in. The joints are mitered and painted before nailing. The inside of the tray is painted white.

Varieties.—Not less than 50 kinds of celery, which are more or less distinct, are catalogued by American seedsmen. The plants vary in size from the Paris Red Ribbed, which is scarcely a foot high, to the Giant Pascal, which is fully three times as tall; and in color of the foliage from the deep green of the Boston Market to the golden yellow of the Paris Golden and the almost pure white of the White Plume. Some kinds are turnip-rooted (see *Celeriac*), others have red leafstalks, and still others are very bitter and pungent; yet all of these variations seem to have resulted from high cultivation and, possibly, in some cases, from crossings of the different kinds. A half dozen leading types may be described.

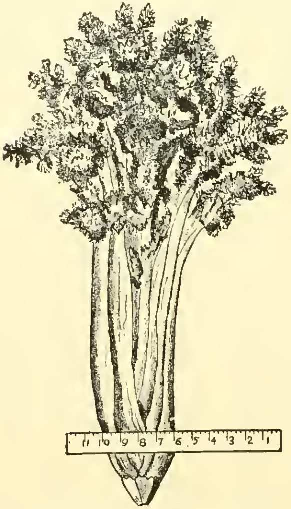
Paris Golden or Golden Self-blanching.—This variety was raised by M. Chemin in his market-gardens near Paris, France, and it was introduced into the United States about 1885. It was entirely distinct from all other varieties, and it gained favor among growers rapidly. Since 1892 or 1893 it has been the leading summer kind, and more generally planted in market-gardens than any other. The plants are stocky, they can be planted closely, conveniently blanched with boards, packed in small space when bunched, the bunches keep remarkably well, are exceptionally attractive when exposed for sale in the market, and the stalks are never disagreeably bitter. Leaf-stalks below the lower pair of leaflets 6 to 8 inches long and from 1¼ to 1¾ inches in circumference, generally with 9 distinct ridges and 13 rather small fibrovascular bundles, the latter not imbedded in green cells, the ridges flattened and the furrows between them shallow; leaf-bearing part of the stalk 12 to 14 inches long, with a decided constriction where the lower pair of leaflets unite with it; leaflets thick, sharply serrate, usually wedge shaped at the base and with characteristic yellow specks, which increase in numbers as the plants mature until the entire foliage appears to be of a light golden hue.



398. Blanching Celery by wrapping it with paper.

The Paris Red Ribbed celery is a very dwarf variety, having thick leaflets with yellow specks in them like the Paris Golden, but the plants are smaller, not so full in the centers and the leaf stalks are shaded with red. Another variety of recent introduction, known as the Broad Ribbed celery, is evidently nearly related to the preceding kinds. The foliage shows the yellow specks, the leaf stalks are large and rounded on the edges, and the plants mature early, but they are open in the center. Some strains of this variety have reddish leaf stalks.

White Plume.—Introduced by Peter Henderson in 1884. For several years this variety was more generally grown than any other kind. The plants are distinctively self-blanching and beautiful, and it has been claimed that this variety surpasses all others as a table decoration. Leaf-stalk below the lower pair of leaflets 8 to 10 inches long, 1 to 2 inches in circumference, light green, becoming pure white when blanched, ridges 9, fibrovascular bundles 13 imbedded in green cells; leaflets large, borne on slender divisions of the main stalk, turning light colored and sometimes nearly pure white when the plants approach maturity. This variety often requires artificial ripening to reduce the strong flavor, in addition to what is necessary to whiten the stalks.



399. Celery plant trimmed for market.

The Pink Plume is a nearly related variety, having reddish stalks but is hardly equal to the preceding kind.

Boston Market.—An old variety, that has been grown in the vicinity of Boston since about 1850. Plants low and spreading, very dark green and glossy, forming numerous secondary crowns, leaf-stalks short and stout, ridges 9 or 11, with shallow furrows between them, fibrovascular bundles 13 or 15, imbedded in green cells; leaflets thick, rounded in outline, deeply cleft, serrations shallow, each terminating in a whitish point. There is a constriction where the lower pair of leaflets unite with the stalk, and the stalk is lighter colored here than elsewhere; above this point the central stalk tapers rapidly to the end.

The Early Arlington celery is a sub-variety of the Boston Market.

Golden Heart.—A popular kind before the introduction of the self-blanching varieties, but now placed in the background with the Golden Half Dwarf, White Solid, Schumacher, Perle le Grande, and Alpha.

Rose.—A tall, red variety, better known than any other kind of this class. It was introduced in 1886 by Peter Henderson, but it never has been extensively grown for market. Leaf-stalk red or purplish, 10 to 15 inches long, 1½ to 2 inches in circumference, ridges 9, fibrovascular bundles 13; leaflets dull green, thin, and the edges inclined to turn upward; the whole plant tall, slender and rather hard to blanch. The young stalks retain the red color when blanched, and are exceptionally attractive in appearance, crisp, and have the nutty flavor that is so highly prized in choice celery. It was formerly supposed that the red varieties of celery kept better than the others, but the supposition does not seem to be well founded.

Other varieties of this class are the Crimson Bouquet, Pink Aromatic, and Convent Garden Rose.

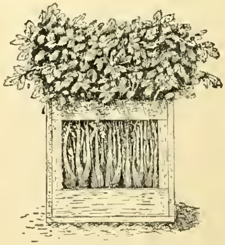
Giant Pascal.—This variety is peculiarly adapted to the production of a large amount of edible matter. The stalks are of the largest size, tender, and never pungent, even before they are blanched; grown both in private gardens and for market. Leaf-stalks very large, long and thick, generally with 12 flattened ridges and 16 fibrovascular bundles; leaflets dark green, thick, deeply cleft and coarsely serrate. Plants with full centers and usually without secondary crowns.

Although the variety is much, the value and appearance of the plant depend much upon the growing. There are different ideals in different parts of the country. In the west, a plant of the type of Fig. 402 is wanted. About Boston, a broad-based and thick-set plant (obtained by much transplanting and less crowding) is demanded (Fig. 403).

Fertilizers.—Celery rarely makes satisfactory growth on land of ordinary fertility; it is a crop that must have liberal treatment to yield good returns. Organic fertilizers rich in nitrogen are mainly used, although generally in market-gardens these are supplemented with potash and other salts. It is customary to apply the organic fertilizers in a decomposed condition and plow them in before the plants are set. Later, when the plants are about half grown, some commercial fertilizer is scattered along the rows before each hoeing. It is important that the fertilizers used should not make the land too porous. They should increase its capacity for holding moisture, and not hasten evaporation. When coarse, light manures must be used for this crop, it is better to place them on the surface as a mulch than to plow them in.

Diseases.—Of diseases, there are two or three serious blights or rusts, but there are no widespread and serious insect depredators. (See Duggar, Bull. 132, Cornell Exp. Sta., and reports from stations in Conn., N. Y. (state), N. J., Dept. Agric., etc.) The best general treatment is to start with healthy seed on land which has not bred the disease, and then spray early and frequently with Bordeaux mixture, or other fungicide. The treatment should all be done early in the life of the crop.

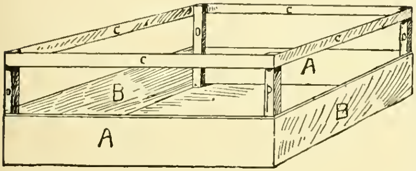
Storing.—If celery is to be kept for winter use, it must be cool and moist. It is usually set out again, so that the roots take sufficient hold upon the earth to prevent the plant from wilting. For home use, the plants may be set in an old shoe case, in which there are a few inches of earth in the bottom, the top of the box being left uncovered. If the box is as deep as the height of the Celery, holes should be made in the side of the box to admit of ventilation. The box may now be kept in a cool cellar. Taking similar precautions, Celery may be stored in barrels in the cellar. For market, Celery may be set in trenches, as shown in Fig. 397. Two boards are then leaned over the plants, to form a gable roof; and as cold weather approaches, straw is thrown on top. In large celery areas, however, the crop is now stored in sheds or cellars made for the purpose. In these sheds, the celery is planted out, and the temperature is kept above hard frost. Full discussion of this method will be found under *Storing.*


400. Celery crate.

For further information, see Greiner's "Celery for Profit"; Vaughan's "Celery Manual"; Van Bochove's "Kalamazoo Celery"; Hollister's "Livingston's Celery Book."

L. F. Kinney.

Commercial Celery Culture.—The increasing demand for this delicious vegetable has interested both the gardener and farmer in studying its needs. They have succeeded so well that the quality has been improved and the length of the market season increased to such an extent that instead of finding it for sale only during the fall and winter months, we now have it the greater part of the year. The greater part of the crop is prepared for shipping by trimming off the outer stalks and roots, washing and tying in bunches of one dozen roots, and packing in boxes containing from 4 to 8 dozen, according to the size of the roots. The California and some of the Michigan and New York growers ship with the roots on unwashed, and load in refrigerator cars, with two decks put in and the bunches placed on the decks. A car contains by this process from 1,200 to 1,500 dozens, while a car loaded with the boxed product contains from 1,500 to 2,000 dozens.

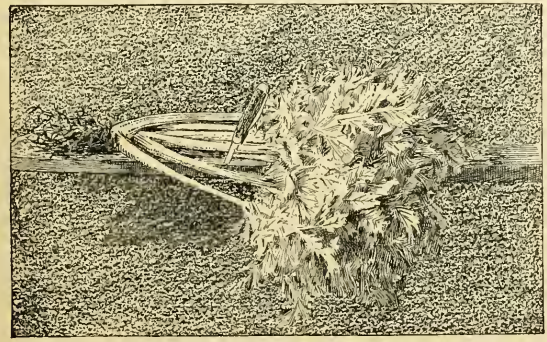


401. Water-holding Celery crate.

The seeds are very small and slow to germinate. The first leaves are small and digest food slowly, which makes it necessary to have plant-food available at all times during the growth of the plant, so that nature may be assisted in her work of building it up and giving to it a constitution strong enough to resist disease, which sometimes comes in the shape of a fungus which attacks the leaves, and, with the plant in its weak condition, absorbs the sap and destroys the digesting surface of the leaf to such an extent that the outer stalks, and sometimes the inner ones as well, dry up, and the crop is a total loss. Fortunately, the climatic conditions for the development of the fungi do not remain more than 3 or 4 days at a time, and, with means for irrigation and with food containing the different materials that the plant desires, this difficulty is successfully met. In Colorado and other parts of the west, they expect to demonstrate that the disease cannot exist, on account of irrigation keeping the plant well supplied with food, the large amount of lime the soil contains, the bright sunlight, and cool nights, as all these are to the advantage of the plant and against the development of fungi.

The soils best adapted to the plant are cranberry bogs and low marshes, filled with a deposit of decayed vegetable matter from 2 to 15 feet deep, which, when drained by open and tile drainage, cleared of trees and roots, the surface cut with disk-harrow, smoothed and pulverized with common harrow and roller, are then ready for a crop of corn or millet the first season. The following season the surface is treated with a ton of air-slaked lime to the acre, which is turned under to hasten the decay of the vegetable matter and correct the accumulated acidity which abounds from the decay of such large quantities of vegetables. The lime also destroys fungous growth and tends to strengthen the constitution of the plant. The surface is then dressed with a fertilizer composed of 1 ton of fine raw bone, 40 bushels of wood ashes, and 500 pounds of salt to the acre. Where barnyard manure can be had, the raw bone is reduced 1,000 pounds, and 20 loads of manure are applied. In Florida the amount of bone is increased to 3,000 pounds, and 200 pounds of high-grade potash added and the ashes omitted. In Colorado, where the soil contains 10 per cent of lime, it is not necessary to use lime. With fertilizers containing 10 per cent of potash, 4 per cent of nitrogen, and 10 per cent phosphoric acid, applied at the rate of 1 ton to the acre, and with the physical conditions of the land improved by turning under green crops, such as corn or alfalfa, success is anticipated. Celery is also raised on sandy loam, but unless 50 loads of coarse manure is plowed under, and water plentifully supplied during growth, either by rains or irrigation, the crop is poor in quality and light in quantity.

In the north and middle states, the early plants are started on hotbeds March 1, and transplanted in coldframes March 10–12, then into the open field after May 10. For the late or main crop, the seed is sown in the open ground April 1, and by June 1 the plants are large enough to cut back to the heart leaves. This makes them stocky and increases the root-growth, and by June 10 they are large enough to be removed to the field, where they are cultivated frequently by both horse and hand cultivators. In Florida, plants are all started under a half shade in August, and transplanted under another half shade made by setting posts in the ground, 5 feet high and 12 feet apart, on the tops of which a board is nailed, forming a rest or frame, and 3-inch slats nailed on 3 inches apart, thus protecting the beds from the bright sun in day time and cold at night. The plants are removed to the open field after September, and planting is continued until about February 1. In Colorado the early plants cannot be grown successfully with glass close to the plants. The bright sun penetrates the soil and takes up the moisture so fast that germination is retarded and takes place very unevenly. By covering the glass with plant-cloth, tacked on the inside, the light is subdued and success attained. For the month of April, beds covered with plant-cloth alone do very well. It is not practical to sow late plants in the open ground without the



402. A good Celery plant of the middle and western states.

403. The Boston ideal.

plant-cloth protection against the bright sunlight and frequent winds that prevail during April and May in this latitude. Close watching and spraying twice each day will bring the seed up, and, after the fourth leaf is well started, the cloth is removed for a few hours toward night each day until the plants are 2 inches high; then the cloth is removed during the night after May 10, and the plants are hardened.

From 20,000 to 30,000 plants are set on an acre. In sixty days plants are large enough to blanch for the early market. Pine boards 1 foot wide, 1 inch thick, 16 feet long, dressed on both sides, are placed against the celery on both sides of the plants, and are held in an upright position by a piece of wire bent at each end so as to form a double hook. The lumber excludes the light, inducing the heart of the plant to grow rapidly and blanch at the same time, and in 15 to 18 days after the lumber is put up, the celery is ready to market. Lumber induces a taller growth, but the flavor is not quite as fine as that blanched with earth. The lumber is safer for early blanching for the reason that the disease commonly called rust is liable to attack the stalks if earth is used before September 10. Earthing up becomes a necessity after September 20, as frost may appear any night after this date and damage the crop where the lumber is used, while that with the earth up to it is protected. The process of earthing up with a spade is seldom seen nowadays, as there are banking plows with attachments that push the leaves into an upright position and turn the earth up at the same time, one horse handling the plow very easily.

In harvesting the crop, leading growers have washing machinery to clean and cool the stalks, which adds to its keeping qualities during transit and delivery from market to the consumer. Great pains is taken to sort and grade the different sized roots, bind them into bunches, and pack them into neat new packages made for the purpose. Large quantities are marketed from September 20 to October 20, to save the expense of storing in the winter houses, as the loss in those is liable to be great from evaporation, disease and consequent decay. California and Florida shipments come in November, and all through the winter months the leading markets are supplied with this appetizing vegetable.

The popular varieties are: First, the White Plume, which is early and makes a very fine appearance, quality medium; and next the Dwarf Golden Heart, which is a little later but much hardier than the former, also possessing much better flavor. The best for winter use are the old reliable Boston Market and its half brother, the Giant Pascal. These two, when grown to perfection, are good keepers and of excellent quality.

E. J. Hollister.

CELÒSIA (Greek, *kelos*, burned; referring to the burned look of the fls. in some species). *Amarantàceæ*. Cockscomb. The genus containing the common Cockscomb of old-fashioned gardens has about 42 species, all tropical and mostly annual herbs, with alternate, entire lvs. narrowed into a petiole, various in form, and with fls. borne in dense spikes. There are two main types of Celosias, the crested form and the feathered or plumy ones. The crested Cockscomb is very stiff, formal and curious, while the feathered sorts are less so, and are used to some extent in dried bouquets. The plumy sorts are grown abroad for winter decoration, especially under the name of *C. pyramidalis*, but to a small extent in America. The crested Cockscomb is less used as a summer bedding plant than formerly, but it is still commonly exhibited in pots at small fairs, the object being to produce the largest possible crest on the smallest plant. For garden use, the seeds are sown indoors in early spring, and the plants set out May 1–15. If the roots dry out the lvs. are sure to drop off. The Cockscomb is a moisture-loving plant, and may be syringed often, especially for the red spider, which is its greatest enemy. A light, rich soil is needed.

A. *Spikes crested, monstrous.*

cristàta, Linn. Cockscomb. Height 9 in. or more; stem very glabrous: lvs. petiolate, ovate or somewhat cordate-ovate, acute, glabrous, 2–3 in. long, 1 in. wide: spikes crested, subsessile, often as wide as the plant is high: seeds small, black, shining, lens-shaped. Tropics. Gn. 13, p. 231. R.H. 1894, p. 58.—There are 8 or 9 well marked colors in either tall or dwarf forms, the chief colors being red, purple, violet, crimson, amaranth and yellow. The forms with variegated lvs. often have less dense crests. *A. Japonica*, Mart., little known to botanists, is said to be a distinct garden plant with branching, pyramidal habit, each branch bearing a ruffled comb.

AA. *Spikes plumy, feathery, or cylindrical.*

argéntea, Linn. Taller than the above: lvs. shorter-stalked, narrower, 2–2½ in. long, 4–6 lines wide, linear-lanceolate, acute: spikes 1–4 in. long, erect or drooping, long-peduncled, pyramidal, or cylindrical. India.—This species is considered by Voss (in Vilmorin's Blumengartnerei), to be the original one from which the crested forms are derived. He makes 9 botanical forms, to one of which he refers *C. cristata*. The range of color is even greater in the feathered type than in the crested type, as one form has whitish fls. The spikes are very various in form and habit. Various forms are shown in Gn. 6, p. 513; 9, p. 149; 17, p. 331. R.H. 1857, p. 78 and 1890, p. 522.

Hùttoni, Mart. Height 1–2 ft.: habit bushy, pyramidal: stem sulcate-striate: lvs. reddish or crimson, lower ones lanceolate, subsessile: spikes red, cylindrical, oblong, obtuse, 1½ in. long: perianth segments oblong (not lanceolate, as in *C. argentea*). Java. G.C. 1.32:214.—A foliage plant, and less common than the two species above.

W. M.

CÉLSIA (Olans Celsius, 1670–1756, a Swedish orientalist). *Scrophulariàceæ*. Herbs, with yellow fls. in terminal racemes or spikes, closely allied to Verbascum, but has only 4 stamens, and they are of two sorts. There are many species. Only **C. Crética**, Linn. f., is known in Amer., and that very sparingly. It is a hardy or half-hardy biennial, with alternate lvs., of which the lower are pinnate and the upper toothed and clasping: fls. large and rotate (nearly 2 in. across), yellowish, with dark markings in the center and conspicuous deflexed stamens. Stout, hairy plant, 3–6 ft. high, from Crete. B.M. 964.

CÉLTIS (ancient Latin name). *Urticàceæ*. Nettle Tree. Trees or shrubs: lvs. alternate, petiolate, stipulate, deciduous or persistent, usually oblique at the base and 3-nerved: fls. polygamous-monœcious, inconspicuous, apetalous, 4–5-merous, staminate in small clusters, pistillate axillary and solitary: fr. a 1-seeded, small drupe, edible in some species. Sixty species in the temperate and tropical regions of the northern hemisphere, of which few hardy ornamental species are cultivated; they are valuable as shade trees or as single specimens on the lawn, mostly with wide spreading head and light green foliage, which is rarely seriously injured by insects or fungi; they thrive in almost any soil and even in dry situations, they are of vigorous growth when young, and are easily transplanted. The straight-grained wood is light and elastic, easily divided, and much used for the manufacture of small articles and for furniture; that of *C. australis* is valued for carving. Prop. by seeds, sown after maturity; also by layers and cuttings of mature wood in fall; rarer kinds are sometimes grafted on *C. occidentalis*.

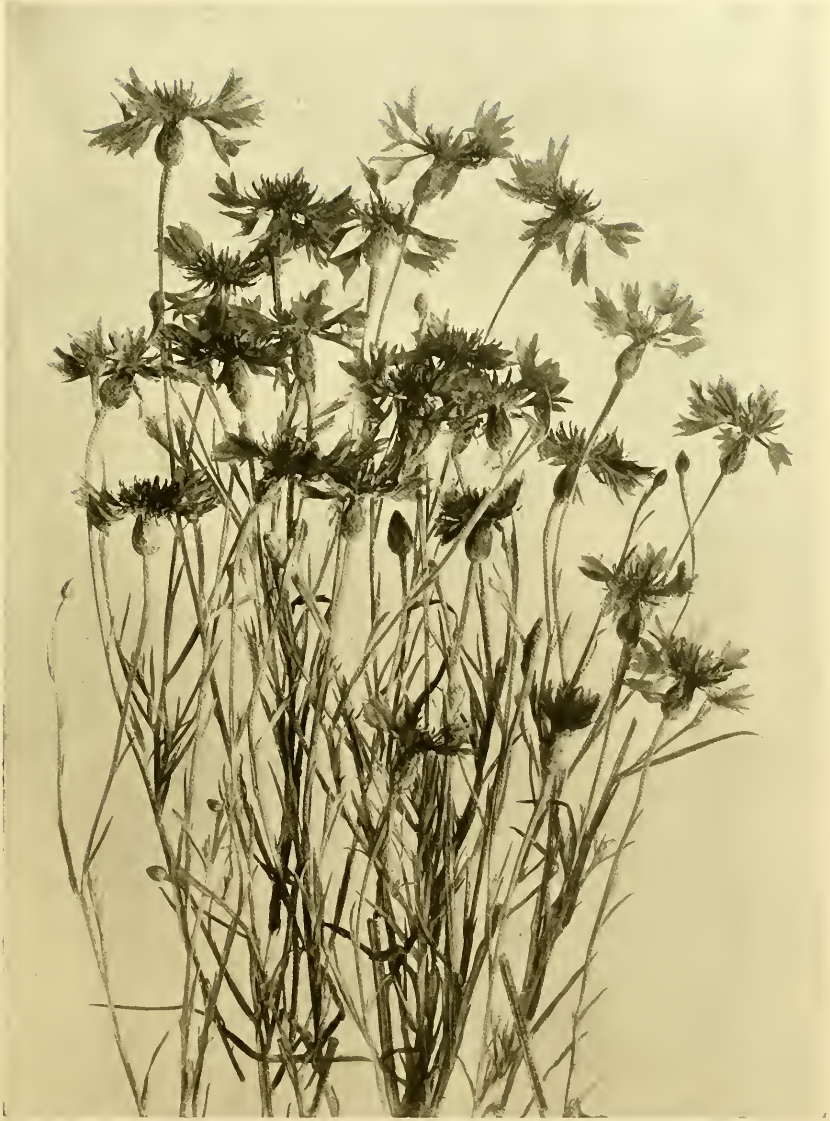
A. *Lvs. entire, or rarely with few teeth, thin, at length glabrous.*

Mississippiénsis, Bosc (*C. lævigàta*, Willd. *C. integrifòlia*, Nutt.). Tree, 60–80 ft.: lvs. unequally rounded or cuneate at the base, oblong-lanceolate or ovate, acuminate, usually falcate, smooth above. 2–4 in. long: fr. orange-red, nearly globular, ¼ in. thick, on slender pedicel, longer than the petiole. From S. Illinois to Texas and Florida, west to Missouri. S.S. 7:318. G.F. 3:41, figs. 9–11. Mn. 7:225, 227.—Var. **reticulàta**, Sarg. Lvs. smaller, ovate, usually cordate, rough above. S.S. 7:319.

AA. *Lvs. serrate.*

B. *Foliage scabrous above, membranaceous, more or less pubescent.*

occidentàlis, Linn. Large tree, occasionally 120 ft.: lvs. oblique and rounded at the base, ovate, acuminate, pubescent when young, light green, 2–4 in. long: fr.



Centaurea Cyanus, or Cornflower. One of the flowers known as Bachelor's Button

orange-red, ½in. long, on slender pedicel, longer than the petiole. S.S. 7:317. G.F. 3:40, 43. Em. 304. Mn. 7:231, 233.—Very variable species. Var. **crassifòlia**, C. Koch, has firm, very rough and large lvs., to 6 in. long, usually cordate at base. Michx. Hist. Arb. 3:228. Var. **pùmila**, Gray, is a dwarf form with smaller lvs.

austràlis, Linn. Tree, to 60 ft.: lvs. oblique, cordate or rounded at the base, ovate oblong, acuminate, pubescent beneath, 2½–5 in. long: fr. over ½in. long, dark purple, sweet: pedicels 2–3 times longer than the petioles. Mediter. region to Persia.—Not hardy north.

BB. *Foliage smooth and glossy above, glabrous or nearly so, leathery.*

Sinénsis, Pers. (*C. Japónica*, Planch.). Tree, to 30 ft.: lvs. usually rounded or cordate at the base, broadly ovate to oblong ovate, acuminate, serrate-dentate, pubescent when young, pale or glaucescent and prominently reticulate beneath, 2–4 in. long: fr. dull orange-red; pedicels rather stout, not much longer than the petioles. China, Japan.—Not hardy north; often the following is cultivated under this name.

Bungeàna, Blume (*C. Davidiàna*, Carr.). Tree: lvs. narrow or rounded at the base, ovate or narrow elliptic, acuminate, crenate-serrate, nearly glabrous when young, green and shining on both sides, 2–4 in.: fr. purplish black, small: pedicels 2–3 times longer than the petioles. N. China.—Hardy, and a very distinct species, with dark green and glossy foliage.

Kraussiàna, Bernh. Tree: lvs. oblong ovate, usually rounded at the base, acuminate, crenate-serrate, pubescent on the veins beneath, semipersistent: ovary tomentose: fr. mostly pubescent, slender pedicelled. S. Africa to Abyssinia.—Hardy only south.

ALFRED REHDER.

CEMETERY. See *Landscape Gardening.*

CÉNCHRUS (ancient Greek name). *Gramíneæ.* Annual or perennial grasses, with spreading or erect culms bearing an inflorescence of globular, spiny burs. Spikelets 1-fld., 1–4 together, with an ovoid or globular involucre of rigid, more or less connate bristles, forming spiny burs, which fall off at maturity. Glumes as in Panicum, awnless. Species about 12, in the tropical and warmer temperate regions of both hemispheres.

tribuloìdes, Linn. SAND-BUR. BUR-GRASS. Culms ascending, branching, 1–2 ft. long, with spikes composed of 10–15 coarse, spiny burs, which readily attach themselves to passing objects. It is one of the worst of annual weeds wherever it becomes abundant. It is distributed more or less throughout the United States in sandy districts, and said to be perennial in the southern states.

P. B. KENNEDY.

CÈNIA (Greek for *empty*, in allusion to the hollow receptacle). *Compósitæ.* Low herbs from South Africa, with the aspect of Mayweed. Head small and rayed, the ray fls. pistillate, the disc fls. compressed and 4-toothed, the receptacle gradually enlarged from the top of the peduncle, and hollow. **C. turbinàta**, Pers., is a common weed in Cape Colony, and it is occasionally seen in Amer. gardens. It is annual, diffusely branched, and a foot or less high, with finely dissected, soft, almost moss-like foliage, and long-peduncled, small, yellow heads. Of easy culture.

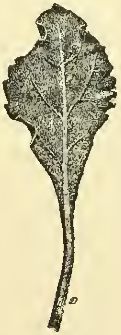
L. H. B.

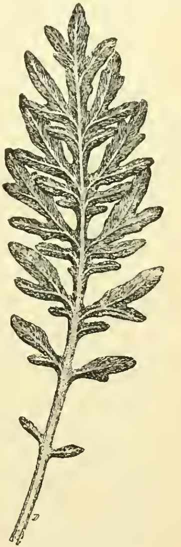
CENTAURÈA (a *Centaur*, famous for healing). *Compósitæ.* CENTAURY. DUSTY MILLER. BACHELOR'S BUTTON. CORN FLOWER. KNAPWEED. Annuals or half-hardy perennials; fine for bedding, vases, baskets and pots, and for borders and edgings. Differs from Cnicus in having the achenes obliquely attached by one side of the base or more laterally. Species about 400, much confused, mostly in Eu., Asia and N. Afr., 1 in N. Amer., 3 or 4 in Chile. The involucre is ovoid or globose, stiff and hard, sometimes prickly. Receptacle bristly. The marginal florets are usually sterile and elongated, making the head look as if rayed. Several Old World species have become weeds in this country.

The following species of Centaurea are here described, the synonyms being in italics: Americana, 7; argentea, 2; atropurpurea, 13; Babylonica, 14; *Benedicta* = Carbenia benedicta; *calocephala*, 13; *candidissima*, 1; Cineraria, 1; Clementei, 3; Cyanus, 4; dealbata, 12; *declinata*, 10; *flore-pleno*, 4; gymnocarpa, 2; *imperialis*, 5; leucophylla, 10; macrocephala, 8; *Margaritacea*, 6; *Margaritæ*, 5; montana, 11; moschata, 5; nigra, 9; *odorata*, 5; *plumosa*, 2; splendens, 6; *suaveolens*, 5; variegata, 9; *Victoria*, 4.

A. DUSTY MILLER.—*White-tomentose low plants, used for bedding or for the sake of their foliage.*

1. **Cinerària**, Linn. (*C. candidissima*, Lam.). Fig. 404. Perennial: sts. erect, 3 ft., branched, the entire plant white-tomentose: lvs. almost all bipinnate (except the earliest), the lower petioled, all the lobes linear-lanceolate, obtuse: scales of the ovate involucre appressed, with a membranous black margin, long-ciliate, the apical bristle thicker than the others: fls. purple. S. Italy, Sicily, etc.—Much used as a bedding plant, not being allowed to bloom. The first lvs. of seedlings are nearly entire (as shown in Fig. 404), but the subsequent ones become more and more cut. Grown both from seeds and cuttings. Seedlings are very apt to damp off unless care is taken in watering.


404. Lower leaf from a young plant of Centaurea Cineraria (× ½).


405. Radical leaf of Centaurea gymnocarpa. (× ½.)

2. **gymnocárpa**, Moris & DeNot (*C. argéntea*, Hort. *C. plumòsa*, Hort.). Fig. 405. Perennial: entire plant covered with velvety white pubescence: sts. 1½–2 ft. high, erect: lvs. bipinnatisect; segments linear, entire, acute: fl.-heads small, in a close panicle, mostly hidden by the lvs.: fls. rose-violet or purple. Caprea.—Very ornamental on account of its velvety finely cut lvs. Much used, like the last, for low foliage bedding; lvs. more compound, and usually not so white.

3. **Cleméntei**, Boiss. Perennial, the entire plant densely white-woolly: sts. erect, branching, with few lvs.: root-lvs. petioled, pinnate, the lobes ovate-triangular, sharp-pointed: st.-lvs. sessile: fl.-heads terminal on the branches, globose: involucre scales with scarious, ciliate margins, scarcely spiny: fls. yellow. Spain.

AA. CORN FLOWER, OR BACHELOR'S BUTTON.—*Tall-growing annual, with very narrow lvs., grown for the showy fls.*

4. **Cỳanus**, Linn. BLUEBOTTLE. BLUET. BACHELOR'S BUTTON (see also *Gomphrena*). CORN FLOWER. RAGGED SAILOR. Fig. 406. Annual, slender, branching, 1–2 ft.

high, woolly-white when young: lvs. linear, entire, or the lower toothed, sometimes pinnatifid: fls. blue, purple or white, the heads on long, naked stems: involucral bracts rather narrow, fringed with short, scarious teeth. S. E. Eu. Gt. 38, p. 641; 39, p. 537.—One of the most popular of garden fls., running into many varieties. It is perfectly hardy, blooming until frost and coming up in the spring from self-sown seed. The following are varieties of this: *Pure White; Victoria*, a dwarf, for pots and edgings; *Emperor William*, fine dark blue; *flore pleno*, with the outer disc fls. converted into ray fls.; *nana compacta*, dwarf.

406. Centaurea Cyanus (× ½).

AAA. SWEET SULTANS.—*Straight-growing, smooth annuals or perennials, with dentate lvs., grown for the large fragrant heads.*

5. **moschàta**. Linn. (*C. suavèolens*, Linn. *C. odoràta*, Hort. *C. Amberbòi*, Mill. *Amberbòa moschàta*, Less.). SWEET SULTAN. Fig. 407. Annual: sts. 2 ft. high, branching below, erect: whole plant smooth, bright green: lvs. pinnatifid, the lobes dentate: fl.-heads long-peduncled; invol. round or ovate, smooth; only the innermost of the invol. scales with scarious margins: fls. white, yellow or purple, fragrant. Orient. Mn. 4:149. Gn. 54:1195. I.H. 42, p. 106. Gng. 4:147.

Var. **álba**, Hort. (*C. Margarìtæ*, Hort.). Fls. white. Gn. 19, p. 337; 54:1195. A.G. 13:607. This form, known as *C. Margaritæ*, is pure white and very fragrant. It was int. by an Italian firm in 1891.

Var. **rùbra**, Hort. Fls. red. Gn. 54:1195.—A popular, old-time garden flower, with long-stalked heads; of easy culture. It does not bear transplanting well.

C. imperiàlis, Hort., is the offspring of *C. moschata* and *C. Margaritæ*, int. into the American trade in 1899. Plants are said to inherit the vigorous, free growth of *C. moschata*, being of the same easy culture and forming clumps 3–4 ft. high. The fls. resemble *C. Margaritæ*, but are twice as large and abundantly borne on long stems from July until frost. They range through white, rose, lilac and purple, are fragrant, and if cut when first open will keep 10 days. *C. Màriæ*, Hort., int. 1899, resembles *C. imperialis*, but the fls. open sulfur-yellow, become lighter, and are tipped with rose.

AAAA. OTHER CENTAUREAS *of various kinds, occasionally grown in hardy borders for their fls. or imposing stature.*

B. *Foliage green on both sides.*

C. *Lvs. pinnate or bipinnate.*

6. **spléndens,** Linn. (*C. margaritàcea*, Ten.). Perennial: sts. erect, branched: lvs. smooth, the lowest bipinnate, the upper pinnate, all with very narrow, linear, entire, acute lobes: fl.-heads subglobose; scales of the involucre with a rounded, almost entire, rather lax tip; fls. purple. Spain, Italy.

CC. *Lvs. entire or dentate, not pinnatisect.*

7. **Americàna,** Nutt. (*Plectocéphalus Americànus*, Don). BASKET FLOWER. Fig. 408. Hardy annual, nearly smooth: sts. stout, simple, 2–5 ft., thickened under the naked head: lvs. mostly entire, oblong-lance-shaped: involucre ½–1½ in. in diam., its bracts all with fringed, scarious appendages; fls. rose or flesh-colored; disc 1–3 in. diam.; narrow lobes of the ray flowers often 1 in. long. Ark. to Ariz. F. S. 4:327. S. H. 2:223.—Very attractive.

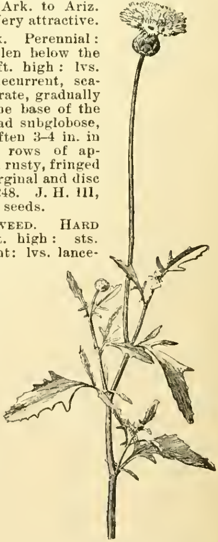
8. **macrocéphala,** Puschk. Perennial: stems simple, erect, swollen below the flower-head, leafy, 2½–3 ft. high: lvs. ovate-lanceolate, slightly decurrent, scabrous, acute, somewhat serrate, gradually diminishing upwards to the base of the single terminal head: head subglobose, larger than a hen's egg, often 3–4 in. in diam.; involucre of 8–12 rows of appressed, scarious-margined, rusty, fringed scales: fls. yellow, the marginal and disc alike. Armenia. B. M. 1248. J. H. III, 33:331.—Often grown from seeds.

9. **nigra,** Linn. KNAPWEED. HARD HEADS. Perennial, 1–2 ft. high: sts. branching, rough pubescent: lvs. lance-shaped and entire or lower sparingly toothed: involucral bracts with pectinate-ciliate-fringed black appendages: fls. all alike, the disc and marginal ones of the same size. Europe. —Var. **variegàta,** Hort. Lvs. edged with creamy white, tufted. A very striking border plant.

BB. *Foliage white or tomentose, at least beneath (often green above).*

C. *Stems low, weak, not strict.*

10. **leucophýlla,** Bieb. (*C. declinàta*, Bieb.). Perennial: stems short, decumbent, with very few lvs.: root-lvs. petioled, tomentose-woolly on both sides, pinnate, the ovate lobes undulate, sparsely cut-lobed or sinuate-toothed: fl.-head with few bracts, solitary, terminal; scales of the ovate involucre lanceolate, acuminate, brown, long-ciliate: fls. purple. Caucasus.



407. Centaurea moschata. (× ¼.)

11. **montàna,** Linn. Mountain Bluet. Perennial: sts. low, stoloniferous, unbranched, 12–16 or rarely 20 in. high: lvs. decurrent, the young ones silvery white, oval-lance-shaped: involucre of 4 or 5 rows of scales, black-ciliate along the margins; fls. blue, the marginal ones 1 in. long, disc-fls. very short, becoming purple. Europe. B.M. 77. Var. **álba,** Hort. Fls. white. Var. **ròsea,** Hort. Fls. rose-colored. Var. **citrina,** DC. (var. *sulphùrea*, Hort.). Disc-fls. brown, rays yellow. Armenia. B.M. 1175.

cc. *Stems erect, simple or branched.*

12. **dealbàta,** Willd. Perennial: sts. sub-erect, 8–24 in. high: lvs. white-villous beneath, glabrous above, the lower ones 1–1½ ft. long, petioled, pinnate, the obovate lobes coarsely cut-toothed or auricled at the base; stem-lvs. sessile, pinnate, with oblong-lance lobes: fl.-head solitary, just above the uppermost leaf: fls. red, those of the disc rosy or white: outer scales of the involucre with lanceolate tips, the middle rounded, deeply fringed, ciliate. Asia Minor, Persia.

408. Centaurea Americana (× ¼).

13. **atropurpùrea,** Waldst. & Kit. (*C. calocéphala*, Willd.). Perennial: sts. erect, branched, about 2–3 ft. high, the branches white-woolly at the summit: lvs. bipinnate, lobes linear-lanceolate, acuminate; lowest lvs. petioled, uppermost pinnatifid: fl.-heads without bracts; invol. scales with fringed ciliate white lanceolate tips, the innermost ones rounded, scarious-margined: fls. black-purple. Hungary.

14. **Babylònica,** Linn. Silvery white perennial: sts. simple, stout, erect, 6–10 or 12 ft. high: lvs. long, coriaceous, strongly decurrent on the stem, the radical lyrate, the lower stem-lvs. oval or oblong-acute, entire or undulate, the upper lance-acute: fls. yellow, the globular heads almost sessile in the axils of narrow bract-like lvs.; ⅓–½ of the stem flower-bearing: involucre-scales with a short, recurved tip. Asia Minor, Syria. Gn. 2, p. 73; 8, p. 263. R. H. 1859, pp. 540–1.—Tall, stout and striking plant.

Jared G. Smith and L. H. B.

CENTAURÍDIUM. See *Xanthisma*.

CENTRADÈNIA (Greek for *toothed gland*, alluding to the anther glands). *Melastomàceæ.* Four species in Mexico and Central Amer., grown in warmhouses for their showy-colored lvs. and pretty fls. They are herbs or shrubs, with angled or winged branches, petiolate, opposite lanceolate or ovate-entire, ribbed lvs., and fls. with 4-lobed calyx, 4 petals, 8 stamens, and a 4-loculed ovary. The blossoms are pink or white, in axillary or terminal clusters. Prop. by cuttings. Very showy and desirable plants. Stems often colored. Centradenias like rich leaf-mold with sharp sand, and brisk heat. Give a light but shady position. Strong plants are much benefited by liquid manure, and such applications give better colors in both flowers and fruit. Monogr. by Cogniaux, DC., Monographiæ Phanerogamarum, 7: 116.

grandifòlia, Endl. Branches 4-winged: lvs. ovate-lanceolate, strongly 3-nerved, brilliant red beneath, long-pointed and curving at the end: cymes many-fld., shorter than the lvs., the fls. light rose, rotate, the petals very obtuse, the stamens unequal. B.M. 5228.—The plant grows 2 ft. high, and blooms in winter. Very showy. The cut branches hold their color a long time, making the plant useful for decorations.

floribúnda, Planch. Branches obscurely angled, pubescent, red: lvs. narrow-lanceolate, tapering below, 3-nerved, red-nerved below: fls. pink, in terminal panicles. F.S. 5:453.—Smaller than *C. grandifolia*.

inæquilateràlis, G. Don (*C. ròsea*, Lindl.). Lvs. ovate-lanceolate, unequal-sided, entire, ciliate, reddish beneath: fls. pink, in terminal corymbose racemes: dwarf. Mex. B.R. 29:20.

L. H. B. and H. A. Siebrecht.

CENTRÁNTHUS (Greek, *spurred flower*). *Valerianàceæ.* A few annual and perennial herbs of the Mediterranean region, with dense clusters of small red or white fls. terminating the branches, and opposite entire or cut lvs.: calyx cut into 5–15 narrow divisions, enlarging after flowering; corolla slender-tubed, 5-parted, spurred at the base; stamen 1: fls. with a pappus-like crest. Of easiest culture.

rùber, DC. Red Valerian. Jupiter's Beard. Perennial, 1–3 ft., smooth and glaucous, forming a compact and floriferous, bushy plant: lvs. ovate to lanceolate, some of them toothed at base: fls. very numerous, deep crimson.—A very handsome old garden plant, too much neglected. It blooms all summer. Excellent for cutting. Increased by division; also by seeds. There is a white-fld. form (var. *álbus*).

macrosiphon, Boiss. Annual, of easy culture in any good soil: 1–2 ft.: lvs. ovate, glaucous, toothed: fls. larger than in the last, red. Spain.—There are white-fld. (var. *álbus*) and dwarf (var. *nànus*) forms. Excellent for rockeries and borders; also good for lawn vases.

L. H. B.

CENTROPÒGON (Greek *kentron*, spur, and *pogon*, beard, referring to the fringed stigma). *Campanulàceæ.* About 36 tropical Amer. sub-shrubs or shrubs, often scandent, with alternate, mostly dentate lvs., and long, tubular fls. which are violet, purple, red, or orange, and usually borne singly on long peduncles: bracteoles very small or wanting. Warmhouse perennial, prop. by cuttings.

Lucyànus, Houllet. Height 1–2 ft.: stem somewhat woody: lvs. short-petioled, finely toothed: fls. rose, winter; hemispherical, with lanceolate segments recurved at the tips. R.H. 1868:290.—Said to be a hybrid of *C. fastuosus* and *Siphocampylus betulæformis*, but seems to show little influence of the latter, which has longer petioles and peduncles, more coarsely toothed lvs., longer calyx-segments, and a yellow-tipped corolla.

fastuòsus, Scheidw. Lvs. peach-like, oblong, acute, bordered with glandular teeth, very glabrous, short-petioled: fls. rose-colored, winter; calyx hemispherical, with 5 lanceolate, denticulate segments. Mex. R.H. 1853:181.

W. M.

CENTROSÈMA (Greek, *spurred-standard*). *Leguminòsæ.* Butterfly Pea. Twining herbs (at least those in cult.), with pinnate, 3–7-foliolate lvs., and showy white or reddish fls. in the axils. Fl. papilionaceous, the standard spurred on the back, the keel broad, and the style bearded at the apex. Species nearly 40 in tropical Amer. and 2 in U. S.

Virginiànum, Benth. Roughish, climbing, 2–6 ft.: lfts. ovate to linear, shining, stipitate: fls. 1–4 in the axil, 1 in. long, violet and splashed, showy: pod straight and long-pointed, 4–5 in. long. Md. S., in sandy lands. A.G. 13:649.—Int. to cult. many years ago, but again introduced in 1892 (as *C. grandiflorum*), and much advertised. It is a hardy and desirable perennial vine, blooming the first season from seed. There is a white-fld. var.

L. H. B.

CENTURY PLANT. Consult *Agave*.

CEPHALANTHÈRA (Greek for *head* and *anther*). *Orchidàceæ*, tribe *Neóttieæ*. About 10 species of small, temperate-region terrestrial orchids, allied to Epipactis, Pogonia, etc. Some of them are western N. American, and others are European. Sepals 3: petals small, ovate: lip saccate: lvs. (sometimes wanting) lanceolate or oblong: fls. mostly small (sometimes showy), in an open spike. The species are scarcely known in cult., but two Japanese species have been offered by importers. These are **E. falcàta,** Blume, yellow, and **E. erécta,** Blume, white.

CEPHALÁNTHUS (Greek, *head* and *flower*; fls. in heads). *Rubiàceæ.* Button Bush. Shrubs with opposite or whorled, entire, stipulate lvs.: fls. small, tubular, white or yellowish, 4-merous, with included stamens and long, exserted style, in globular heads: fr. dry, separating into 2 nutlets. Six species in Amer., Africa and Asia, of which only the one North American species is cult. Hardy ornamental shrub, with handsome glossy foliage and very attractive with its flower balls appearing late in summer. It thrives in any good garden soil, best in a sandy, somewhat moist one. Prop. by seeds or by cuttings of ripened wood in fall, and also by greenwood cuttings taken from forced plants early in spring.

occidentàlis, Linn. Shrub, 3–12 ft.: lvs. long-petioled, ovate or oval, acuminate, glossy above, glabrous or slightly pubescent below, 3–6 in. long: heads about 1 in. in diam., long-peduncled, 3 or more at the end of the branches. July–Sept. From New Brunswick south, west to Ontario and Calif. Em. 394. R.H. 1889, p. 280.—Var. **angustifòlia**, André. Lvs. oblong, lanceolate, usually in 3's. R.H. 1889, p. 281.

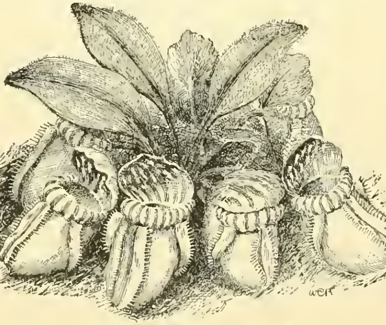
Alfred Rehder.

CEPHALÀRIA (Greek for *head*, alluding to the capitate flower-clusters). *Dipsàceæ*. Coarse annual or perennial herbs of Europe, Africa and Asia, much like Dipsacus, but the heads less spiny. The heads are terminal and globular, bearing many 4-parted yellowish, whitish or bluish florets.

Tatarica, Schrad. Perennial, 6 ft., rank, with striate stems, suited to the rear border, where strong effects are desired, with showy cream-white flat heads in July and Aug.: lvs. pinnate, the lfts. broad-lanceolate and serrate. Grows readily, and is increased by seed or dividing the clumps.

L. H. B.

CEPHALOTÁXUS (Greek, *head; Taxus*-like plant, with fls. in heads or clusters). *Coniferæ*, tribe *Taxàceæ*. Trees or shrubs, with evergreen, linear, pointed lvs. with 2 broad, glaucous lines beneath, arranged in 2 rows: fls. diœcious, staminate in 1–8-fld., short-stalked clusters, pistillate consisting of a small cone with several bracts, each bearing 2 naked ovules. Seed enclosed in a fleshy envelope, drupe-like, about 1 in. long, reddish or greenish brown. From allied genera it may be easily distinguished by the resin-canal in the center of the pith, and by the glaucous lines beneath from Taxus, which has the lvs. yellowish green beneath, and from Torreya by the glaucous lines being broader than the 3 green lines, while in Torreya the glaucous lines are narrower than the green ones. Six closely allied species from Himal. to Jap. Ornamental evergreen shrubs, in appearance very like a yew, but of more graceful habit. Not hardy north, or only in very sheltered positions. They thrive best in a somewhat moist but well-drained, sandy loam, and in partly shaded situations. Prop. by seeds, stratified and sown in spring; imported seeds usually do not germinate until the second year; increased also by cuttings in August, under glass, and by veneer-grafting in summer, on one of the species or on *Taxus baccata*. For cions and cuttings, terminal shoots should be selected, which form regular plants with whorled branches like seedlings, while cuttings from lateral branches grow into irregular, low, spreading shrubs.



409. Cephalotus follicularis (× ⅓).

A. *Lvs. 2–3 in. long: branchlets yellowish green, pendulous.*

Fórtunei, Hook. Lvs. tapering gradually into a sharp point, usually falcate, dark green and shining above: fr. greenish brown, obovate. N. China, Jap. B.M. 4499. F.S. 6:555. R.H. 1878, p. 117.—This is the most graceful species, with long and slender branches, attaining in its native country 50 ft. in height, in culture usually remaining a shrub.

AA. *Lvs. 1–2 in. long.*

pedunculàta, Sieb. & Zucc. With spreading, often somewhat pendulous branches, dark green when young: lvs. to 2 in. long, narrowed into a sharp point, shining and dark green above: fr. ovoid, rounded at both ends, rarely globular. Jap., China. G.C. III. 18:716.—In Japan, tree to 25 ft. high, usually shrub in culture. A remarkable form is var. **fastigiàta**, Carr. (*Podocárpus Koraiàna*, Sieb. & Zucc.), of columnar habit, with upright branches and spirally arranged lvs. G.C. II. 21:112. S.H. 2:450. Gng. 2:341.

drupàcea, Sieb. & Zucc. Branches spreading, stiff, usually light green when young: lvs. about 1 in. long, abruptly pointed, narrow and straight, often upturned: fr. usually obovate, narrowed at the base. Jap. G.C. III. 18:717.—This is the dwarfest species, usually forming a low bush with stiff, spreading branches.

Alfred Rehder.

CEPHALÒTUS (Greek, *in a head*, referring to the crowded stamens). *Saxifragàceæ*. One species in Australia. Lvs. all radical, of two kinds, the ordinary foliage lvs. being spatulate or elliptic, hairy, and entire, the others being pitchers with purple tints and a netted and veined lid. The fls. are borne in an interrupted spike, on an erect scape; they are apetalous, and have a white, 6-parted calyx, 12 stamens in two sets, and 6 1-seeded carpels. The species is **C. folliculàris**, Labill. (Fig. 409). It is cult. in coolhouses for its odd insectivorous pitchers, which are 1–3 in. long and beautifully lined and shaded with purple and green. The plant is grown in peat and moss, after the manner of Drosera and Dionæa. Delights in plenty of moisture, mounted on sphagnum moss. Give a cool and shady position. Prop. by seeds (allow only one seed vessel to mature) and also by division. A most interesting plant. R.B. 23:233. I.H. 27:391. J.H. III. 35:260.

L. H. B. and H. A. Siebrecht.

CERÁSTIUM (Greek for *horn*, alluding to the shape of the pod). *Caryophyllàceæ*. Decumbent annuals or perennials, with weak, slender stems, small, opposite lvs. and small white fls.: differs from Arenaria in the shape and dehiscence of the capsule: sepals 5 or 4; petals as many, often 2-cleft; stamens 10 or less. Valuable in rockeries or for bedding and borders. Species about 100, of world-wide distribution.

A. *Lvs. green, merely pubescent.*

arvénse, Linn. (var. *oblongifòlium*, Holl. & Britt.). Starry Grasswort. Fig. 410. Perennial, low, much branched and matted; stems 8–12 in. long; lvs. oblong or lanceolate, pale green, pubescent, obtuse, ½–1½ in. long, ¼ in. wide: fls. very numerous, appearing in April and May; petals 5, deeply bifid; capsules twice as long as the calyx. On magnesian rocks, N. Y. to Va. and westward. Bul. 74, Ind. Agr. Exp. Sta., from which Fig. 410 is adapted.—Recommended as a bedding plant, for its mat-like habit, covered with white bloom.

AA. *Lvs. silvery or grayish.*

B. *Capsule equaling the calyx.*

grandiflòrum, Waldst. & Kit. Creeping perennial: lvs. linear, acute, the margins reflexed; inflorescence dichotomous: fl.-stems 6–8 in. high: petals oval, 2-parted, transparent white, twice as long as calyx. E. Europe.

BB. *Capsule much longer than the calyx.*

Bièbersteinii, DC. Stems 6 in., creeping, diffuse, branched: lvs. ovate-lanceolate, tomentose-woolly; peduncles erect, dichotomous; capsule ovate-cylindrical. Tauria. B.M. 2782.—Like *C. tomentosum*, but with larger lvs. Fine for edgings.

Boissièrii, Gren. Low: lvs. silvery, ovate-lanceolate, acute, entire, sessile; peduncles 4–12 in. high: inflorescence a dichotomous cyme: fls. large, white. Spain.

410. Cerastium arvense.

tomentòsum, Linn. Low, creeping, branched: lvs. oblong, spatulate, grayish woolly, upper lvs. lanceolate; peduncles 6 in. high, erect, dichotomous: capsule cylindrical. Eu.—Much used for edgings.

Jared G. Smith.

CÉRASUS. Consult *Prunus*.

CERATIÒLA (Greek, *a little horn*, referring to the 4-branched, serrate stigma). *Empetràceæ.* A heath-like evergreen, much-branched shrub from the sand barrens of Ga. and S. C.; rarely cult. N., but not hardy. Only 1 species.

ericoìdes, Michx. Height 2–8 ft.: branches subverticillate, marked with scars of numerous fallen lvs., the younger and upper ones only retaining foliage: lvs. crowded, almost whorled, ½–¾ in. long, linear, rigid, shining, pale, rounded above, grooved beneath: fls. inconspicuous, diœcious, of peculiar structure: berries round, orange-yellow. B.M. 2758.

CERATÓLOBUS (Greek for *horned pod*). *Palmàceæ.* Spiny Javanese palms, with pinnate lvs., sometimes seen in fine collections, but not in the Amer. trade. The species are *C. cóncolor*, Blume; *C. glaucéscens*, Blume; *C. Micholitziàna*, Hort. G.C. III. 23:251; *C. Findleyànus*, Hort., A.G. 15:169. Treated the same as Calamus.

A small genus of warmhouse palms, natives of Java and Sumatra. The members of this genus are slender-growing, spiny palms, with pinnate leaves, one of the best being *C. Micholitziana*, which has rather short pinnæ irregularly grouped along the rachis. A shaded house, with a night temperature of 65° to 70°, a moist atmosphere, and plenty of water at the root, are the most essential points in their culture.

L. H. B. and W. H. Taplin.

CERATÒNIA (Greek for *horn*, in reference to the large pod). *Leguminòsæ.* A tree of the Mediterranean basin, belonging to the Cassia tribe. The petals are wanting; stamens 5; pod long, filled with a pulpy substance. **C. Siliqua**, Linn., the only species, is now widely distributed in warm countries, being grown both for shade and for the edible pods. It reaches a height of 40–50 ft. It is evergreen. Lvs. pinnate, shining, the lfts. oval and obtuse. It thrives well in S. Calif. and S. Fla. The pulp about the seeds is sweet and edible, but the fruit is used chiefly for feeding stock. In Europe these pods are much prized for the fattening of swine. The dry pods are occasionally seen in the fruit stands in northern markets. Var. **longissima** differs only in having very long pods. The Ceratonia is known as Algaroba, Carob, Karoub, Caroubier, and St. John's Bread. The last name records the notion that the seeds and sweet pulp are respectively the locusts and wild honey which St. John found in the wilderness. The dry valves or pods have been supposed to be the husks which became the subsistence of the prodigal son. See G.F. 3:318, 323.

L. H. B.

CERATÓPTERIS (Greek, *horn fern*). *Ceratopteridàceæ.* A genus of aquatic tropical ferns, forming the type of a distinct family. The plants root in mud, and the sterile lvs. either float on the surface or are carried above the surface of the water. The sporophylls are bitripinnate, with pod-like ultimate segments, entirely unlike the sterile lvs. Only a single species is known. **C. thalictroìdes**, Brongn. Tropical waters of both hemispheres, rare in Florida.—Useful in ponds and aquaria. Must be taken indoors on approach of cold weather. Best grown when planted in loam and leaf-mold topped with spagnum, and tied in a pan or crib and set into a tub in medium temperature, with the crown on top of the water. To propagate, pull out several of the center leaves, and new crowns will form; these can be divided.

L. M. Underwood and H. A. Siebrecht.

CERATOSTÍGMA (Greek, *horned stigma*). *Plumbaginàceæ.* Different from Plumbago in having no glands on the calyx, stamens aduate to the corolla tube, fls. in dense clusters rather than spicate, and other technical characters. There are 3 or 4 species in warm regions of the Old World. Herbs or sub-shrubs, with alternate, obovate lvs. and blue or rose-red fls.

plumbaginoìdes, Bunge (*Plumbàgo Lárpentæ*, Lindl. *Valoràdia plumbaginoìdes*, Boiss.). Perennial herb, 6–12 in., the stem red and branchy: lvs. entire, strongly ciliate on the edges: fls. slender-tubed, with a wide-spreading, deep blue limb, the 5-lobes minutely toothed, collected in dense heads or umbels. China. B.M. 4487. F.S. 4:307.—A hardy bedding plant, producing profusely of its deep blue fls. late in fall. Very valuable. Needs covering in winter in the N.

L. H. B.

CERATOTHÈCA (Greek for *horned capsule*). *Pedaliàceæ.* Tropical African herbs of 3 or 4 kinds, with usually opposite lvs. which are ovate, 5-parted calyx, 2-lipped corolla, fls. solitary in the axils, and a 2-horned capsule. **C. triloba**, Meyer, is occasionally grown in S. Fla., and it may be adapted to glasshouses. It is a tall herb (5 ft.), with the habit of foxglove, probably biennial, hairy: lvs. stalked and crenate-dentate: fls. 3 in. long, blue, pubescent, deflexed, the lower lobe prolonged. Handsome. B.M. 6974.

CERATOZÀMIA (Greek, *horned Zamia*; referring to the horned scales of the cones, which distinguish this genus from Zamia). *Cycadàceæ.* Handsome Mexican foliage plants, with Cycas-like lvs., but less commonly cultivated in American palm-houses than Cycas. Best raised from young imported plants, but rarely prop. by seeds, or by offsets from the slow-growing trunk. Burn out the center of the plant with a hot iron, and a number of offsets will spring from the trunk and the crown; these may be used for propagation.

Mexicàna, Brongn. Trunk thick, short, covered with the remains of fallen leaf-stalks: lvs. rich, dark green, pinnate, on prickly petioles 5–6 in. long, which are shaggy when young; leaflets very numerous, 6–12 in.

long or more, lanceolate: cones produced annually on separate plants; female cones 9–12 in. long, 4–6 in. thick, the scales 2-horned; male cones narrower, longer, on a hairy stalk, the scales with two small teeth. Mex. Gn. 9, pp. 308, 309.—An excellent decorative plant, best grown in sandy loam. Give freely of water and heat in spring and summer, but keep cooler and dryer in winter.

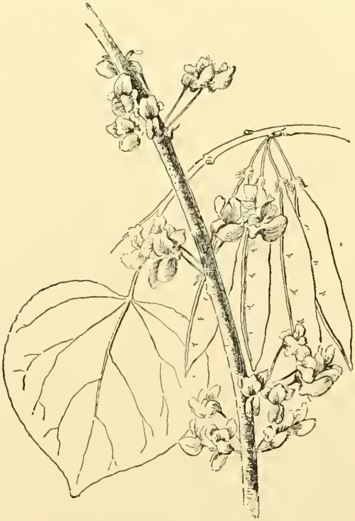
H. A. Siebrecht and W. M.

CERCIDIPHÝLLUM (*Cercis* and *phyllon*, leaf; the lvs. resemble those of Cercis). *Trochodendràceæ.* Tree, with deciduous, usually opposite, petioled and palmately nerved lvs.: fls. diœcious, inconspicuous, apetalous, solitary, staminate nearly sessile, bearing numerous stamens with slender filaments, pistillate pedicelled, consisting of 3–5 carpels, ending in long, purplish styles and developing into about ¾in. long, dehiscent pods, with many seeds. One species in Japan. Hardy, ornamental, shrubby tree of pyramidal and, when young, almost fastigiate habit, with handsome, light green foliage, purplish when unfolding, turning bright yellow or partially scarlet in fall. It prefers rich and moist soil, and grows rapidly when young. Prop. by seeds, sown in spring, and by greenwood-cuttings, taken from forced plants in early spring, or by layers; cuttings from half-ripened wood in summer, under glass, grow also, but not very well.

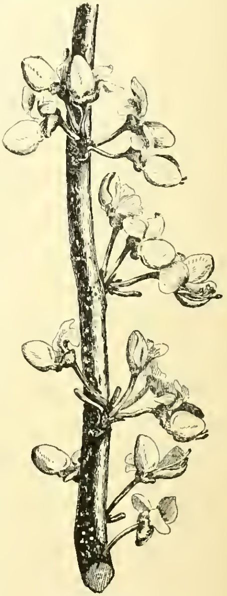
Japónicum, Sieb. & Zucc. Bushy tree, usually 20–30 ft., but sometimes rising to 100 ft., with slender, glabrous branches: lvs. opposite, occasionally alternate, slender petioled, cordate, orbicular or broadly ovate, obtuse, crenate-serrate, glabrous, glaucous beneath, 2–3 in. long. Japan. G.F. 7:106, 107, and 6:53. Mn. 3:74. Gng. 5:135.—A very desirable tree, one of the best of the newer introductions from Japan.

Alfred Rehder.

CÉRCIS (*Kerkis*, ancient Greek name). *Leguminòsæ.* Judas Tree. Red Bud. Trees or shrubs: lvs. deciduous, alternate, petioled, palmately nerved, entire: fls. papilionaceous, pedicelled, pink or red, appearing before or with the lvs., in clusters or racemes from the old wood: calyx 5-toothed, red: petals nearly equal, the uppermost somewhat smaller: pod compressed, narrow-oblong, narrow-winged on the ventrical suture, many-seeded. Seven species in N. America, and from S. Europe to Japan. Very ornamental trees or shrubs, with handsome, distinct foliage and abundant showy fls. in spring, very effective by their deep pink color. They are well adaped for shrubberies or as single specimens on the lawn, and attain rarely more than 20 or 30 ft. in height, forming a broad, irregular head when older. Only *C. Canadensis* is hardy north, while none of the others can be grown successfully farther north than New York. They grow best in rich, sandy and somewhat moist loam, and should be transplanted when young, as older plants can be hardly moved with success. Young plants, 4 or 5 years old, produce fls. freely and may be recommended for forcing, especially *C. Chinensis*, which is the most beautiful of all. Prop. by seeds, sown in spring, best with gentle bottom heat; sometimes increased by layers, or by greenwood cuttings from forced plants in early spring; *C. Chinensis* grows also from greenwood cuttings in summer under glass.



411. Cercis Canadensis (× ½).



412. Cercis Chinensis. Natural size.

A. *Lvs. abruptly and short acuminate, usually slightly pubescent near the base beneath.*

Canadénsis, Linn. Fig. 411. Tree, to 40 ft.: lvs. roundish or broadly ovate, usually cordate, 3–5 in. long: fls. rosy pink, ½in. long, 4–8 in clusters: pod 2½–3½in. long. From New Jersey south, west to Missouri and Texas. S. S. 3: 133–34. A. F. 13: 1370. Gng. 6: 290. F.E. 9: 593.—A very desirable ornamental tree for the northern states. There is also a variety with double fls.

Chinénsis, Bunge (*C. Japónica*, Sieb.). Fig. 412. Tree, to 50 ft., shrub in culture: lvs. deeply cordate, roundish, with a white, transparent line at the margin, subcoriaceous, shining above, 3–5 in. long: fls. 5–8, purplish pink, ¾in. long: pod 3–5 in. long, narrow. China, Japan. F.S. 8: 849. Mn. 2:139. G.F. 6: 476.—The most beautiful species, with the fls. nearly as large as those of *C. Siliquastrum* and more abundant.

AA. *Lvs. rounded or emarginate at the apex, usually broader than long.*

occidentàlis, Torr. (*C. Califórnica*, Torr.). Shrub, to 15 ft.: lvs. cordate, roundish, glabrous, about 2 in. wide: fls. rose-colored, ½in. long: pod 2–2½in. long. Calif.—A closely allied species is *C. renifórmis*, Engelm. (*C. Texénsis*, Sarg.). Small tree: lvs. subcoriaceous, 3–5 in. wide, sometimes pubescent beneath: pod 2–4 in. long. Texas, N. Mexico. S.S. 3:135.

Siliquástrum, Linn. Tree, to 40 ft.: lvs. roundish, deeply cordate, glabrous, 3–5 in. wide: fls. 3–6, purplish rose, ¾in. long: pod 3–4 in. long. S. Europe, W. Asia. B.M. 1138. Gn. 42: 879, and 52, p. 5.—There is a variety with white fls.

Alfred Rehder.

CERCOCÁRPUS (Greek, *tail* and *fruit;* the fruit with a long, hairy tail). *Rosàceæ.* Small trees or shrubs, with alternate, persistent, rather small lvs.: fls. inconspicuous, apetalous, whitish or reddish, in the axils of fascicled lvs.: fr. an akene, surmounted by the persistent,

Flowers of the Red-bud, Cercis Canadensis

long and hairy style. Small genus of about 4 species, in the Rocky Mts. from Montana south to Mexico; without decorative value, but probably valuable for covering dry, rocky or gravelly slopes in arid temperate regions, as they thrive under very unfavorable conditions. The very heavy and close-grained wood is manufactured into small articles, and valued as fuel and for making charcoal. They may be cultivated in a peaty and sandy, well drained soil in sunny positions, and prop. by seeds or by cuttings of half-ripened wood under glass. **C. ledifòlius**, Nutt., is the hardiest, and stands frost to zero. It has narrow, entire lvs., while the Mexican **C. fothergilloides**, HBK., has the lvs. somewhat larger, serrate and tomentose beneath, and clustered fls. **C. parvifòlius**, Nutt., has cuneate-obovate, coarsely serrate lvs. D. M. Andrews, of Colorado, who handles this shrub, writes of it as follows: "Mountain Mahogany, 6 feet. A nearly evergreen rosaceous shrub of peculiar and attractive habit of growth. Flowers white, early, followed by the long, plumose akenes, which are 3–5 in. long, strangely curled and twisted, arranged above and on each side of the slender branches, so that at a little distance they have an appearance suggestive of ostrich plumes. Easily transplanted, and thrives anywhere."

Alfred Rehder.

CÈREUS (from the Latin; some think it comes from the word for *candle*, in allusion to the shape of the stem; others that it comes from the word for *pliant*). *Cactàceæ*. A genus of varying habit, from stout-columnar to almost globular, deflexed or creeping or slender-climbing, generally ribbed. The fls. are borne singly on the side of the stem; they have a long tube which, with the ovary below it, is beset with scales or bracts; petals numerous and spreading. The sts. bear numerous tubercles or woolly tufts, which bear spines; these spines are usually of two kinds or groups,—the interior ones, or "centrals," which stand at nearly right angles to the stem, and the outer ones, or "radials," which are variously spreading. The largest Cacti are Cereuses. A genus of about 100 species, extending from the arid regions of southwestern U. S. southward through Mex. and Cent. Amer. into S. Amer. Formerly the genus was made to include the numerous species of Echinocereus, but these are now regarded as forming a distinct genus. Those who miss well known Cereus forms from the following list should look under Echinocereus. Not all of the specific names to be found in the trade catalogues can be accounted for at present, but the following synopsis contains the most important in the Amer. trade; and the unidentified names will be found in the supplementary list. See *Cactus*.

John M. Coulter.

The Night-blooming Cereuses are the only species (except *C. flagelliformis*) which are generally cultivated. The sts. of the Night-blooming Cereus are either cylindrical or angled, and are trailing or climbing in habit. Some species grow to a great height. They are excellent for growing against pillars or rafters in the greenhouse. They grow most luxuriantly where they receive abundant light and a good circulation of air. They are not particular about soil, but do well in any open, porous compost. Great care should be taken that the drainage is perfect, as stagnation at the roots of such fleshy succulent plants is sure to prove disastrous. During the summer months the stems should be syringed twice a day; but during the winter they require no syringing and very little water. Good plants can be grown in pots, using a compost of one-half good fibrous loam and the other half lime rubbish, broken brick and sand. The best species are *C. grandiflorus*, *C. MacDonaldiæ*, *C. nycticalus*, and *C. triangularis*. At the Harvard Botanic Garden is a very large plant of *C. triangularis*, which has often had as many as 65 to 70 flowers open in one night. The flowers of all the species open but once. They collapse when the sun strikes them.

Robert Cameron.

The following Cereuses are here described: Alacriportanus, 22; Alamosensis, 8; *atropurpureus*, 45; azureus, 34; Baumanni. 27; *Belieuli*, 24; Bonplandii, 44; *Baxaniensis*, 43; Bridgesii, 33; cæsius, 35; candelabrum, 24; candicans, 4; Cavendishii, 29; chalybæus, 25; Chilensis, 7; Chiotilla, 10; *coccineus*, 37; Cochal, 21; cærulescens, 32; *colubrinus*, 27; Donkelærl, 49; Dumortieri, 16; *Dyckii*, 11; eburneus, 19; *edulis*, 19; Emoryi, 39; *eriophorus*, 30; eruca, 41; euphorbioides, 12; extensus, 59; *Fernambucensis*, 42; flagelliformis, 47; *formosus*, 42; *gemmatus*, 15; geometrizans, 20; giganteus, 1; grandiflorus, 50; grandis, 42; Greggii, 36; gummosus, 40; hamatus, 56; Haukeanus, 17; inermis, 55; isogonus, 28; Jamacuru, 23; lageniformis, 33; lamprochlorus, 5; *Landbecki*, 32; leptophis, 47; MacDonaldiæ, 61; macrogonus, 18; Mallisoni, 48; marginatus, 15; Martianus, 53; Martinii, 46; Maynardii, 51; Mexicanus, 38; *monacanthus*, 46; *monoctonos*, 22; Napoleonis, 58; nycticalus, 54; *Olfersii*, 12; Pasacana, 3; Pecten-aboriginum, 18; *Pernambucensis*, 42; Peruvianus, 22; Pitajaya, 42; platygonus, 31, 48; princeps, 43; Pringlei, 1; *pruinosus*, 19; *pugioniferus*, 20; Queretarensis, 9; Regelii, 57; repandus, 30; Rœzlii, 13; *rostratus*, 56; *Schrankii*, 37; *Seidelii*, 34; serpentinus, 26; *Smithii*, 48; Spachianus, 6; *speciossisimus*, 37; speciosus, 37; spinulosus, 52; splendens, 29; stellatus, 11; tephracanthus, 14; Thurberi, 2; *Tonelianus*, 11; tortuosus, 45; triangularis, 60; uranos, 50; *validus*, 23; *variabilis*, 42, 43.

A. *Sts. erect, 2 in. or more in diameter.*

B. *New growth green, not pruinose* (i. e., *not covered with a bloom or glaucum*).

C. *Ribs of stem 10 or more.*

1. **gigantèus**, Engelm. Suwarro. Fig. 413. A stout form, 25–60 ft. high, simple or with a few erect branches shorter than the main st.: ribs 12–15 below, 18–21 above, often almost obliterated and spineless on older parts: spines straight, bulbous at base, white or straw-color, becoming ashy or dark, the 6 centrals stout, the 11–17 outer ones setaceous: fls. yellowish or whitish: fr. oval or pear-shaped, 2–3 in. long and 1–2 in. in diam. In rocky valleys and on mountain sides from Ariz. into Sonora and L. Calif. B.M. 7222. A.G. 11:451, 528.—The best known of the tree forms. The young plants are globular for several years. Forms the cordon forests of the Sonoran region. Runs into crested or cristate forms.

C. Prínglei, Wats., is one of the cordon Cereuses of N. Mex. Not so tall as *C. giganteus*, ribs fewer, and fls. scattered. Not in cult. G.F. 2:65.

2. **Thúrberi**, Engelm. Several stems arising from the same root, becoming 10–15 ft. high, fasciculate-jointed: ribs 13–16, very slightly prominent: spines 7–16, slender and rigid or almost setaceous, very unequal in length: fls. greenish-white: fr. globose, 1–3 in. in diam., olive-color, with crimson pulp. Southwestern Ariz., through Sonora and L. Calif.

3. **Pasacàna**, Weber. A gigantic species, reaching a height of 20–30 ft., and sometimes even 50 ft., and a diam. of 12–16 in.; sparingly branching above; in new growth dark green, becoming gray or bluish: ribs 15–20, or in young plants only 9–10: areolæ ⅜–¾ in. apart, large, brown, becoming yellowish and finally gray: radial spines 10–13, about 1 in. long, the under one or lowest pair straight, subulate, the others curved; centrals mostly 4, the under and upper ones the longest, reaching 2 in. in length, straight or curved; the young spines are clear brown, often with alternating rings of light and dark tissue, later gray, bulbose at the base: fls. from the lateral areolæ, about 6 in. long, white. Argentine Republic.—This is the giant Cereus of the Argentine desert, as *C. giganteus* is of the Mojave desert.

4. **cándicans**, Gillies. Stems upright, low, cylindrical, bright green, 2½–3 ft. high by 6–8 in. in diam.; freely branching from the base: ribs 10, obtuse angled: areolæ ⅝–¾in. apart, large, depressed, white, becoming gray: radial spines 11–14, spreading, at first thin, needle form, later stronger, stiff, straight, about ¾ in. long; central solitary or later, 3–4 additional ones appearing above, stronger, reaching a length of 1¼ in., sometimes somewhat curved; all the spines horn-colored, with tips and bases brown, later becoming gray: fls. long, funnel form, resembling those of Echinopsis, 10 in. long by 6 in. in diam.: fr. spherical to ellipsoidal, about 3 in. in diam., red, somewhat spiny, flesh white. Argentine Republic.

5. **lamprochlòrus,** Lem. Related to *C. candicans*. of a taller growth, cylindrical, 3–6½ ft. high by about 3 in. in diam., at first simple, but later branching at the base; in new growth bright green, later dirty green: ribs 10–11 or occasionally 15; conspicuously crenate, later blunt and but little crenate: areolæ medium size, about ½in. apart, yellowish white, becoming gray; above each areola two radiating grooves form a letter V: radial spines 11–14, spreading, straight, sharp-pointed, about ⅜in. long, clear to dark amber color; some are strong and rigid, while others are bristle-form; centrals mostly 4, somewhat longer, stronger and deeper colored, with brown bases, becoming dark gray, about ¾in. long: fls. from the previous year's growth, about 8–10 in. long by 6 in. in diam., white. Argentine Republic.

6. **Spachiànus,** Lem. Stems upright, at first simple, later profusely branching at the base, branches ascending parallel with the main stem, 2–3 ft. high by 2–2½ in. in diam., columnar: ribs 10–15, obtuse, rounded: areolæ about ½in. apart, large, covered with curly yellow wool, becoming white: radial spines 8–10, ¼–⅜ in. long, spreading, stiff, sharp, amber-yellow to brown; central solitary, stronger and longer; all the spines later becoming gray: fls. about 8 in. long by about 6 in. in diam., white. Argentine Republic.

7. **Chilénsis,** Colla (*C. Chiloénsis*, DC.). Stems strong, upright, simple (so far as known), about 2½ ft. high by 3½–5 in. in diam., cylindrical to somewhat clavate, bright, clear green: ribs 10–12, obtuse: areolæ about an inch apart, large: radial spines straight, sharp, rigid, at first 9, but later 4 others appear above these; centrals mostly 4, seldom but a single one, bulbose at the base; the young spines are brown honey-yellow, becoming white, with dark tips, and finally gray: fls. from the upper lateral areolæ, about 6 in. long, white, resembling those of Echinopsis. Chile.

cc. *Ribs of stem 7–9.*

8. **Alamosénsis,** Coult. Upright columnar, about 2 ft. high by about 2 in. in diam., several stems arising from a common root-crown: ribs 7–9, compressed and slightly crenate: areolæ prominent, about 1–1½ in. apart, hemispherical, densely covered with short, reddish brown wool: radial spines 15–18, slender but rigid, rather unequal, spreading, straight or curved, ¾–1 in. long, ashy gray; centrals commonly 4, much stouter and longer, the three upper ones erect or divergent, the lowest (usually the longest and somewhat flattened), porrect or deflexed, all more or less angular, sometimes teretish, 1¼–2 in. long, when young yellowish, with dark brown base, finally becoming gray: fls. from the upper lateral areolæ, funnel-form, about 1½ in. long, red. Northern Mexico.

9. **Queretarénsis,** Weber. Arborescent, with a trunk about 3 ft. high by about 14 in. in diam.; the much-branched crown has a diameter of 12–16 ft., the total height of a plant being about 20 ft.; branches dark green, in young growth frequently of a peculiar violet-brown: ribs 6–7, separated by sharp grooves, which later become much flattened, and the stem consequently more cylindrical: areolæ depressed, dark brown: radial spines 6–9, the lower ones the longest, about 1¼ in. long; centrals 4 (often but 2), reaching 1½ in.: fls. numerous from the upper part of the branches, about 4–5 in. long: fr. yellow to red, about 2 in. long, covered with dark yellow to brown spines, about 1 in. long, and bulbose at the base. Mexico.

10. **Chiotílla,** Weber. Arborescent, stem reaching a diameter of 16 in., freely branching from the base upward, the whole plant reaching a height of 16 ft., with a crown 12–14 ft. in diam., branches 8 in. in diam., dark green: ribs mostly 7 (seldom 8): areolæ elliptical, pointed above and below, large, gray: radial spines 10–15, straight, very stiff, radiate, ¼–⅜ in. long: centrals 1–2, rarely 3–4, the under one long and very strong, about 2 in. long, curved downward, and either to the right or to the left, the others about half as long; all the spines are horn colored; the narrow groove connecting the areolæ bears a few bristles: fls. from the lateral areolæ, near the end of the branches, 1¼–1½ in. long, sulphur-yellow: fr. spherical, little more than an inch in diameter, scaly, brown-red, with a violet flesh within. Mexico.

11. **stellàtus,** Pfeiff. (*C. Dýckii*, Mart. *C. Tonelliànus*, Lem.). Stems upright, columnar, 10–14 ft. high, light green; branches upright, 2–3 in. in diam.: ribs 7–10, rarely 15: areolæ ½–1 in. apart, sunken between adjacent swellings of the rib: radial spines 8–10, about ⅜in. long; centrals 3–5, the upper ones upright or divergent, the under one porrect, about ½–¾ in. long; all the spines bulbose at the base, rigid, white, and sometimes with dark tips, turning gray with age: fls. forming a crown at the end of the stem, about 2 in. long, light pink: fr. spherical, 1½ in. in diam., red outside and carmine-red within. Central Mexico.—Fruit edible and common in the Mexican markets.

12. **euphorbioides,** Haw. (*C. Ólfersii*, Otto). Columnar, simple, 10–16 ft. high by about 4½ in. in diam., in young growth pale green, changing with age to gray-green: ribs 8–10, separated by sharp grooves, sharp-angled, becoming flattened in older growth: areolæ about ⅜in. apart, small, white to gray: radial spines mostly 6, the under one the longest, reaching a length of over an inch, strong, yellowish brown to black, the upper ones shorter and bristle form; central solitary, in young plants twice as long as the radials; all the spines finally become gray: fls. from near the crown, 3½–4 in. long, beautiful flesh-red, remaining open for 24 hours. Brazil. R.H. 1885, p. 279.

13. **Rœzlii,** Haage. Upright, columnar, about 3 in. in diam.: ribs 9, separated by sharp, somewhat serpentine grooves, obtuse; above the areolæ, two radiating, slightly curved grooves form a letter V: areolæ ½–¾ in. apart, comparatively large, slightly sunken, yellowish, later gray: radial spines 9–12, radiate, nearly ½in. long, straight, subulate, tolerably sharp, slightly thickened at the base, clear brown, with darker stripes; central solitary, reaching 1½ in. in length, straight, porrect, later somewhat deflexed, clear brown; later all the spines become gray. Andes of Peru or Equador.

14. **tetracánthus,** Lab. Upright, arborescent or bushy, freely branching, young branches leaf-green, later gray-green: ribs 8–9, low, arched: areolæ medium sized, slightly sunken, about ½in. apart, white to gray: radials 5, later 7, radiate, about ⅜in. long, straight, subulate, stout, white, with brown tips and bases, later ashy gray; centrals 1–3, under one largest and porrect, when young yellow and translucent, later gray: fls. resemble those of *C. tortuosus*. Bolivia.

ccc. *Ribs of stem 3–6.*

15. **marginàtus,** DC. (*C. gemmàtus*, Zucc.). Simple or branching at apex, 2–3 in. in diam., with 5–6 obtuse ribs, which are woolly their whole length: spines short-conical, rigid, 7–9, all nearly alike: fls. brownish purple, about 1½ in. long: fr. globular and spiny. Mexico.—Frequently used for hedges in S. Mexico. The stem is often covered with a woody crust.

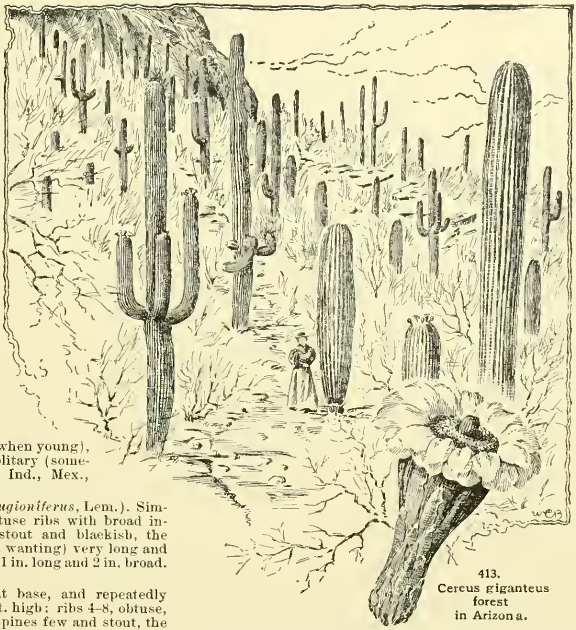
16. **Dumortièri,** Salm-Dyck. Tall, strong, 6-angled, columnar stems, much resembling *C. marginatus*, but with the confluent areolæ armed with slender, needle-form, yellow spines: radials about 9–15, radiating, about ⅜–¾ in. long; centrals 1–4, the under one longest, reaching 1½ in. in length: fls. numerous, funnel-form, about 2 in. long, opening to about 1 in. in diam., white. Mexico.

17. **Hankeànus,** Weber. Upright, robust, not branching (so far as known), young growth bright green, later dark green, about 2 in. in diameter: ribs 4–5, compressed, about 1¼ in. high, conspicuously crenate, with an S-form line passing from each areolæ toward the center of the stem: areolæ ⅜–1 in. apart, horizontally elliptical to heart-shaped, brown, becoming gray below and yellow above: radial spines 3, needle-like, stout, sharp-pointed, about ⅜in. long, amber-colored when young, turning to brown; central solitary, straight, porrect, ⅝in. long, stronger than the radials, horn-colored; later all the spines become gray: fls. 4–5 in. long, white. S. Amer.

BB. *New growth blue, white- or gray-pruinose*
(i. e., *covered with a bloom*).

C. *Ribs of stem comparatively broad and low; more or less triangular in transverse section.*

18. **macrógonus,** Otto. Arborescent, sparsely branching, reaching a heigh of 20 ft. (in cultivation, 6 ft. high



413. Cereus giganteus forest in Arizona.

by 3–5 in. in diam.), branches columnar: ribs mostly 7, seldom 8–9, thick, slightly undulate, obtuse and with convex faces, about 1 in. high, bluish green, frequently having a depressed line near the areolæ: areolæ about ½in. apart, large, gray: radial spines 6–9, radiate or spreading, strong, subulate, ¾in. long, horn color, later black; central spines 1–3, somewhat stronger and longer than the radials, more or less conspicuously porrect: fls. from the lateral areolæ, near the end of the branches, 2½–3 in. long, tolerably fleshy, white: fr. depressed-globose, 2 in. in diam. by little more than 1 in. long. Brazil.

C. Pécten-aborígínum, Wats., is closely allied to the above. It is Sonoran, but not known to be in cult. G. F. 7: 335.

19. **ebúrneus**, Salm-Dyck (*C. pruinòsus*, Otto. *C. édulis*, Hort.). Stem simple and glaucous, with 7–10 ribs: spines subulate, rigid, ivory-white, with black tip (purplish when young), radials 8–10, central usually solitary (sometimes 3–4): fls. purplish. W. Ind., Mex., Cent Amer., S. Amer.

20. **geométrizans**, Mart. (*C. pugioníferus*, Lem.). Simple, 4 in. in diam., with 5–9 obtuse ribs with broad intervals: spines 3–6, unequal, stout and blackish, the solitary central one (sometimes wanting) very long and stout: fls. pinkish white, about 1 in. long and 2 in. broad. Mexico.

21. **Còchal**, Orcutt. Stout at base, and repeatedly forking above, becoming 4–10 ft. high: ribs 4–8, obtuse, with wide, shallow intervals: spines few and stout, the solitary central one stoutest: fls. purplish green, 1–1½ in. long: fr. the size and shape of an olive, not spiny, red (frequently grayish or yellowish brown). L. Calif.—The short and stout woody trunk is often 1ft. in diam., the long branches 2–8 in. in diam.

cc. *Ribs of stem strongly compressed laterally.*

22. **Peruviànus**, Haw. (*C. monoclònos*, DC.). Hedge Cactus. Tall, 30–50 ft., branching freely toward the base, columnar, 4–8 in. in diam., new growth dark green and glaucous, becoming a dull green with age, and, in old stems, becoming corky: ribs 5–8, compressed: areolæ ½–1 in. apart, in new growth covered with conspicuous, curly brown wool, becoming gray: radial spines about 6–7, about ⅜–½ in. long; central solitary, reaching a length of 2½ in.; the number of spines increases with age to as many as 20, all are rigid, brown: fls. abundant, from the lower part of the stem, white, nocturnal, 6–7 in. long by 5 in. in diam. Fla., W. Ind., Mex. and S. Amer. G.C. III, 24: 175 (var. *monstrosus*).

Var. **Alacriportànus**, K. Sch. (*C. Alacriportànus*, Mart.). Of somewhat weaker growth, low, and less conspicuously pruinose in the new growth, which is consequently nearly clear green. S. Brazil.

23. **Jamacàru**, Salm-Dyck (*C.válidus*, Haw.). Stems upright, robust, rigid, 12–16 ft. high by as much as 6 in. in diam.; young growth azure-blue, turning dark green with age, glaucous: ribs 4–6, thin, compressed, crenate: radial spines 5–7, stiff, needle-like, clear yellow with brown points, or brown and finally black, about ½–¾in. long; centrals 2–4, somewhat stronger, porrect, ¾–3 in. long: fls. large, 10 in. long by 8 in. in diam., white nocturnal. Braz., Venezuela.

24. **candelàbrum**, Weber (*C. Belieùli*, Hort.). Tall, columnar, simple or branching only at the base, dark green with a faint trace of blue, 30 ft. high by 4 in. in diam.: ribs 9, blunt, strongly compressed, ¾in. high, slightly crenate: areolæ 1–2 in. apart, ovate, large, white: radial spines mostly 9, the under ones longest and about an inch long, laterally compressed, the upper ones shorter, round, all bulbose and black at the base, ivory-white above; central solitary, very large, 3–4 in. long, dagger-like, laterally compressed and faintly angled, porrect, ivory-white to gray, base black and strongly bulbose: fls. from the lateral areolæ, 3–4 in. long, white: fr. the size of a small orange, covered with small scales, in the axils of which are wool and bristles Mexico.

25. **chalybæus**, Otto. Stems upright, branching above, arborescent, azure blue and pruinose, later dark green, 1½–4 in. in diam.: ribs 6, in young growth very much compressed, later depressed till the stem is nearly cylindrical: areolæ about ⅜in. apart, dark gray-brown; radial spines mostly 7, about ½ in. long; centrals 3–4, similar but somewhat stronger and a little longer; all the spines are pointed, stiff, when young are black, later brown to gray with black tips, bulbose at the base: fls. very similar to those of *C. cærulescens*. Argentine Republic.

AA. *Stems erect, less than 2 in. in diam.*

B. *Ribs of stem 10 or more.*

26. **serpentinus**, DC. Stems columnar, tall, slender, flexuose, 5–8 ft. high by 1–1½in. in diam., tapering at the point: ribs 10–13, low, obtuse: areolæ about ⅜in. apart: radial spines 10-12, slender, needle form, stiff, ⅜in. long; centrals 1–4, pink and white when young, later gray; the number of spines increases by new ones appearing later: fls. from the upper lateral areolæ, slender, green, spiny tube with funnel-shaped corolla, about 6 in. long by 3 in. in diam., white, nocturnal: fr. ovoid, red, covered with deciduous spines. Cent. Mex. B.M. 3566.

27. **Baùmannii**, Lem. (*C. colubrìnus*, Otto). Stems dark green, slender, flexuose, columnar, reaching a height of 6 ft. and a diam. of 1–1½ in., the few branches ascend-

ing slender, parallel with the main stem: ribs 12–16, rounded: areolæ close together, brown; spines fine, slender, very sharp, 15–20, fascicled, white to yellow or dark brown, about ¼ in. long; sometimes a single one from the center reaches a length of ¾ in.: fls. numerous, tubular, zygomorphous, 2½–3 in. long by about ½in. in diameter throughout, red or sometimes with orange-red petals and red tube. Uruguay, Paraguay and Argentine Republic.

28. **isógonus**, K.Sch. Stem upright, columnar, about 1–1¼ in. in diam., in young growth light green to yellow-green, later darker: ribs 15–16: areolæ approximate, white, turning gray: radial spines as many as 20, spreading, at first clear or dark yellow, becoming white, and finally gray, bristle form, flexible, about ⅜ in. long; centrals 6–8; two of these are somewhat stronger and stiffer, about ¾ in. long, one directed upward and one downward, yellowish brown to dark honey-color; later gray, as in the radials. S. Amer.

29. **spléndens**, Salm-Dyck. Columnar, slender, short, rigid, more or less branching from the base, reaching a height of about 2 ft. and about 1–1½ in. in diam., light to yellowish green: ribs about 10–12, rounded: areolæ prominent, about ¼ in. apart, tawny, becoming white, tomentose: radial spines 8–12, radiating, yellow and light brown, becoming gray; centrals 1–3, scarcely larger than the radial, yellowish to white; all the spines slender, bristle form, about ¼–¾ in. long.—This may be but a lower, stouter form of *C. repándus*. *C. Cavendíshii* has been referred to this species, but with some question.

BB. *Ribs 8–10.*

30. **repándus**, Haw. (*C. erióphorus*, Pfeiff.). Stem simple, 20 ft. high, tapering at summit and jointed, with 8–10 obtuse ribs: spines 9–12, needle-shaped, white with black tips: large white, funnel form flowers, the calyx-tube covered with long wool. W. Indies.

31. **platýgonus**, Otto. At first upright, later somewhat reclining, branching, at the base about 1 in. in diam., tapering in the new growth: ribs 8, low, arched: areolæ about ¼ in. apart, very small, yellow, becoming gray, subtruded by a small 3-angled bract; radial spines 12–15, spreading, bristle form, little more than ⅛ in. long; central solitary, slightly longer and stronger; all the spines at first yellow-brown, changing to white or gray with age.

32. **cæruléscens**, Salm-Dyck (*C. Lándbeckii*, Phil.). Arborescent or shrubby, 3–5 ft. high: stems 1–1½ in. in diam.: ribs usually 8, obtuse: areolæ approximate, white bud soon becoming black: spines rigid; radials 9–12, ¼–½ in. long, black; centrals 4, ¾ in. long, stronger, black or white: fls. from the side of the stem, slightly curved, 6–8 in. long by 6 in. in diam., tube bronze-green, corolla white or occasionally rose-pink: frs. ellipsoidal, pointed at both ends, about 3 in. long and half that in diam., bright red, with blue glaucous covering. Argentine Republic. B.M. 3922.

33. **Bridgesii**, Salm-Dyck. Upright, tall, columnar, simple or later branching at the base, bright green when young, becoming blue to gray-green, 1½–2 in. in diam.: ribs 5–7, very broad and low: areolæ ½–¾in. apart, yellowish to gray: spines 3–5, radiating, the under one, or seldom the upper one, the longest, 1½ in. long, stiff, sharp, straight, dark honey-yellow, with brown tips, becoming gray with age. Bolivia.

Var. **lagenifórmis**, K. Sch. (*C. lagenifórmis*, Först.). Spines more numerous, somewhat longer.

34. **azùreus**, Parm. (*C. Seìdelii*, Lehm.). Stem upright, tall, slender, columnar, branching from the base, in the young, fresh bluish green, later dark green with gray, glaucous covering, about 3–4 ft. high and about 1 in. in diam.: ribs 5–7, rounded, enlarged at the areolæ: areolæ about ¾–1 ft. apart, elevated, large, abundantly woolly when young: spines 8–18, nearly alike, about ⅛–⅜ in. long, stiff, slender, needle-form to bristle-like, black; the 2–4 central ones somewhat longer: fls. 8–12 in. long, obliquely attached to the stem, slightly curved, white. Braz.

35. **cæ̀sius**, Otto. Upright, columnar, branching at the base, somewhat tapering above; in new growth, beautiful light blue, pruinose; later, light green to slightly bluish, about 1½ in. in diam.: ribs 5–6, separated by sharp grooves, about ½ in. high, compressed, faintly crenate, becoming depressed in older growth: areolæ about ⅜ in. apart, small, yellow at first, later becoming white and finally gray: radial spines 8–10, sometimes more appear later; radiate, light amber-color, brown at the base, the lower pair the longest, mostly about ½ in. long; centrals 4–7, like the radials but usually somewhat stronger, longer and darker; all the spines thin, needle-form, flexible, sharp; later, light horn-color, finally gray. S. Amer. (?).

36. **Greggii**, Engelm. Slender and branching, 2–3 ft. high and ¾–1 in. in diam., from an extraordinarily large, tuberous root (often 6–10 in. long and 4–6 in. in diam.): ribs 3–6, acute: spines subulate from bulbous base, very short and sharp, 7–11, 1 or 2 being central: fls. white or yellowish, 6–8 in. long; fr. ovate, alternate at base and apex, bright scarlet, fleshy and edible, 1–2 in. long. Southwestern Tex. to Ariz., and south into Chihuahua and Sonora. Generally in gravelly or hard, clayey soil.

37. **speciósus**, K. Sch. (*C. coccíneus*, Salm-Dyck. *C. Schránkii*, Zucc. *C. speciosíssimus*, DC.). Slender, much branched from toward the base; stems about 2 ft. in length by about 1 in. in diam., sometimes having aërial roots near the young growth: ribs 3–5, serrated: areolæ occupy the short upper side of the serrations, large, copiously white, woolly: spines fascicled, 5–8, more in age, spreading, slender, stiff, sharp-pointed, the under one bristle-form, about ½ in. long, yellow: fls. appearing from the older growth of the stems; large, 6 in. in diam., remaining open several days, purple-red, with irridescent, bluish center: fr. ovoid, with a few scattering scales, 1½–2 in. long. Mex. and Cent. Amer. B.M. 3822. I.H. 32:548. Gn. 53, p. 153.—This species is commonly hybridized with other species of Cereus and of Phyllocactus, giving rise to numerous horticultural varieties.

38. **Mexicànus**, Lem. Said by Lemaire to be a garden hybrid between *C. speciosus* and some other species not mentioned.

AAA. *Stems prostrate.*

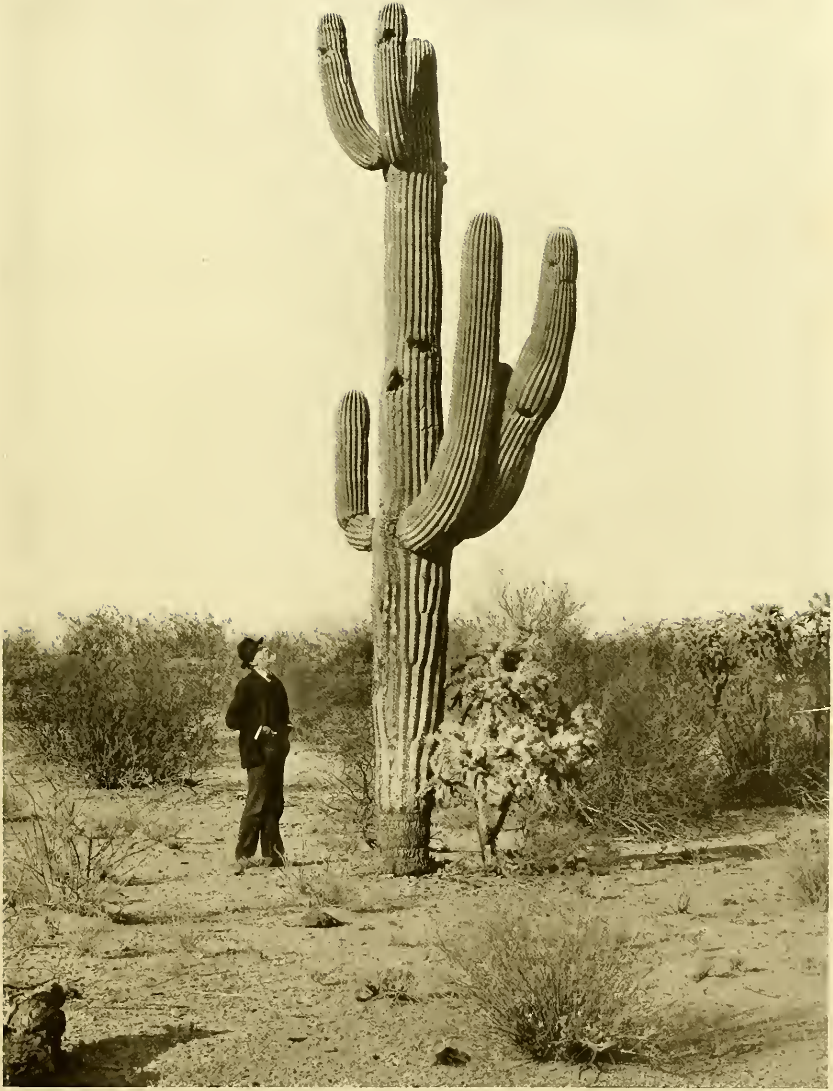
39. **Émoryi**, Engelm. Prostrate, cylindrical, 2–4 ft. long, with ascending or erect branches 6–10 in. high and 1–2 in. in diam.: ribs 15, tuberculate: spines slender and rigid, interlocked, yellow; radials 40–50, very slender; central usually solitary, stouter and much larger: fls. greenish yellow, 1–2 in. broad: fr. globose, very spiny, 1–1½ in. in diam. Rocky hills, S. Calif. into L. Calif. and adjacent islands.—Grows in thick masses, covering patches 10–20 ft. square.

40. **gummòsus**, Engelm. (*C. gumminòsus*, Hort.). Prostrate and assurgent, 1–4 ft. long, 3–4 in. in diam., dull purplish green: ribs (on young branch) 7–9, tuberculate: spines stout and rigid, black, from a strong, bulbous base; radials about 12; centrals 3–6, stout and angled: fls. purple, 4–5 in. long: fl. subglobose, about 3 in. in diam., spiny, bright scarlet with purple pulp ("color of ripe watermelon"), acid and pleasant. L. California.

41. **erùca**, Brandegee. Prostrate and stout, single or slightly branched, 2–4 ft. long, 3–7 in. in diam., rooting from the under surface, generally in patches of 20–30: ribs 13–21: spines stout, ashy, interlocked; centrals 5–8, stouter, the lowest flattened and strongly deflexed: fls. 4–5 in. long, reported to be yellow: fr. globular, 2 in. in diam., somewhat spiny, dull red, with purple pulp. Sandy plains, coasts of L. Calif. and adjacent islands.—A plant of curious and uncouth habit, often in large masses, and from a distance "looking like a lot of firewood thrown at random on the ground."

AAAA. *Stems weak, clambering over rocks or other plants for support; without aërial roots.*

42. **Pitajàya**, DC. (*C. Pernambucénsis* [*Fernambucensis*], Lem. *C. formòsus*, Salm-Dyck. *C. variábilis*, Pfeiff.). Stems at first simple, later branching, in young growth light green, turning grayish green with age, pointed, ¾–1¼in. in diam.: ribs 3–5, commonly 4: areolæ about 1 in. apart, large, bearing a conspicuous amount of



Cereus giganteus, the Suwarro in its native place

curly hair, about ½in. long, in new growth: radial spines 5–7 and a solitary central one, uniform, about ⅜–⅝in. long, amber color to brown and finally gray: fls. from the older growth, large, about 8 in. long, slightly curved, white, nocturnal. Uruguay, Brazil, Columbia. B.M. 4084. —*C. grandis*, Haw., according to Dr. Weber, is but a larger form of this species.

43. **príncepe**, Pfeiff. (*C. Baxaniénsis*, Karw. *C. variábilis*, Engelm.). Erect, 3–10 ft. high, 2 in. in diam., and 3- or 4-angled: spines 4–6, stout and radiant, unequal, the larger 1–1½in. long: fls. white, long-tubular, 7–8 in. long: fr. oval, spiny, 2–3 in. long, scarlet, and with luscious red pulp. Lower Rio Grande, on Mex. side.—The young shoots are said to have 8 ribs and more numerous slender spines, and in cultivated forms the spines are often much longer than given above.

44. **Bónplandii**, Parm. Stems at first upright, later clambering over rocks and bushes, about 1–1½in. in diam., branching and spreading, in new growth commonly of a bluish or purplish green, later gray-green: ribs 4–6, sharp, compressed, crenate, separated by broad, concave faces; later the ribs become much depressed, so that the stem is sometimes nearly cylindrical; the ribs commonly run spirally around the axis of the stem: areolæ ½–1½in. apart, at first considerably depressed, later shallower, white, becoming gray: radial spines 4–6 (later 1–4 more appear), straight, spreading, the largest about ½–1 in., stout, subulate, pointed, the under one needle form and shorter; central solitary, straight, stronger, 1 in. long, deflexed or porrect; the stronger spines are white, with tips and bases brown, when young beautiful ruby-red, later all are gray, with black tips and bulbous bases: fls. from the lateral areolæ, about 10 in. long, white, nocturnal: fr. nearly spherical, about 2 in. in diam., mammate, dark carmine-red. Paraguay, Brazil, and Argentine Republic.

45. **tortuósus**, Forbes (*C. atropurpùreus*, Haage). Stems slender, weak, at first upright, but later reflexed, reaching a length of 3–4 ft., and 1–1½in. in diam.: ribs commonly 7, sometimes but 5, rounded, low, separated by regular serpentine grooves: areolæ about 1 in. apart, large: radial spines 5–8, about ⅜–1 in. long: centrals 1–4, about ¾–1½in. long; all the spines slender, rigid, red-brown when young, becoming ashy with age: fls. from the previous year's growth, about 6 in. in length, trumpet-shaped, tube olive-green and spiny, in the axils of the reddish green scales; outer petals pale green, tinted with brown; inner petals clear white: fr. spherical, brilliant red without and white within, mammate, bearing a few spines on the summits of the lower mammas. Argentine Republic.

46. **Mártinii**, Lab. (*C. monacánthus*, Hort.). At first upright, later requiring a support; freely branching from the base, branches long, reaching nearly 5 ft., ¾–1 in. in diam., slightly tapering, dark green: ribs 5–6, separated by serpentine grooves, contracted between the areolæ; sometimes the ribs are not evident, when the stem is cylindrical: areolæ about 1–1½ in. apart, white: radial spines 5–7, reddish, short, bristle-form, with bulbous bases or short conical, usually about ⅛ in. long; central solitary, mostly deflexed, ½–1 in. long (in young growth, frequently not longer than the radial), subulate, robust, light brown or white, with bases and tips black: fls. from the older growth stems, 8–9 in. long, clear white, nocturnal: fr. spherical (very similar to *C. tortuosus*), pointed, dark carmine-red, about 2 in. in diam., mammate, a few spines on the mammas, toward the base of the fr. Argentine Republic. R.H. 1860, pp. 658–9. —This species is commonly sold under the name of *C. platygonus*

AAAAA. *Stems more or less climbing, attaching themselves to trees, walls, etc., by means of aërial roots.*

B. *Ribs of stem 5 or more.*

47. **flagellifórmis**, Mill. RAT-TAIL CACTUS. Creeping or pendent, slender and very branching, cylindrical, ½–1 in. in diam., branches 1 ft. long or more: ribs 10–12, tuberculate: spines short, rather rigid; radials 8–12, reddish brown; centrals 3 or 4, brown, with golden tip: fls. funnel-form, crimson, 2–3 in. long: fr. globose, ½in. in diam., reddish and bristly, the pulp greenish yellow ("with the taste of a prune"). W. Ind., Mex., Cent. Amer., S. Amer.—This is commonly hybridized with other species. It is a very common window plant.

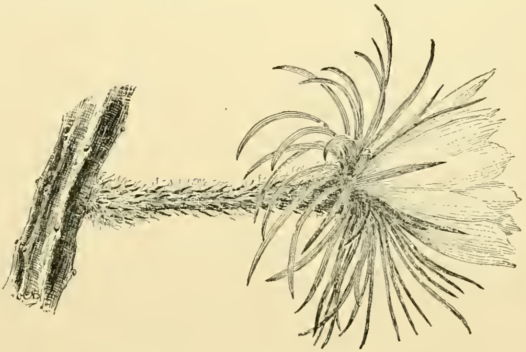
Var. **léptophis**, K. Sch. (*C. léptophis*, DC.). Of more handsome appearance: new spines on the growing point carmine-red: ribs at the most 8: fls. somewhat smaller and lighter.

48. **Mállisoni**, Hort. (*C. Smíthii*, Lindl.). This is a garden hybrid of *C. flagelliformis* on *C. speciosus*. Habit of *C. flagelliformis*, but stouter: fls. more like those of *C. speciosus*. B.M. 3822.

49. **Donkelàeri**, Salm-Dyck. A bushy epiphyte, richly branching, clinging to the bark of trees by aërial roots, commonly in company with orchids; branches very long and thin, scarcely ⅜in. in diameter, cylindrical or inconspicuously 6-angled, or rarely 7–8-angled: areolæ very close together, small, white: spines 10–15, very short, snow-white; sometimes 2–3 short, stronger spines appear in the center of each cluster: fls. resembling those of *C. grandiflorus*. Brazil.

50. **grandiflòrus**, Mill. FRAGRANT NIGHT-BLOOMING CEREUS. Fig. 414. Diffusely creeping, with very long and flexuous climbing 5–7-angled branches, ½–1 in. in diam., with bunches of white bristles associated with the 5–12 short spines: fls. white and fragrant, 6–8 in. broad. W. Ind., Mex. B.M. 3381.—Long cultivated in gardens as the "Night-blooming Cereus," and made to vary widely. *C. Uranos*, Hort., is but a form of this species.

51. **Màynardii**, Lem. (*C. grandiflòrus*, var. *Màynardii*, Hort.). A garden hybrid of *C. grandiflorus* on *C. speciosus*. Habit of *C. grandiflorus*, but red colors of *C. speciosus*.



414. Cereus grandiflorus, one of the night-blooming Cereuses (× ⅓).

52. **spinulòsus**, DC. Stems slender, climbing, reaching a height of 8–10 ft., ¾–1 in. in diam., branches more slender: ribs commonly 5, sometimes 6, sharp, becoming obliterated with age: areolæ small, about ½in. apart: radial spines about 8, very short, bristle-form, brown, becoming gray; central solitary, somewhat longer: fls. 5–6 in. long by 3–4 in. in diam., white, flushed

with pink, nocturnal. W. Ind. and Mex.—The plant much resembles *C. grandiflorus*, but is easily distinguished by its smaller and different colored fls.

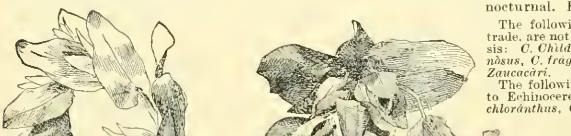
53. **Martiànus**, Zucc. Of bushy growth, branching, reaching a height of 3 ft. and more; branches slender, provided here and there with aërial roots, cylindrical, about $\frac{3}{4}$in. in diam: ribs commonly 8, straight, separated by sharp grooves, very low: areolæ $\frac{1}{4}$–$\frac{3}{8}$ in. apart, small, white: radial spines 6–10, bristle-form, spreading, clear honey-yellow, at base brownish, later whitish and becoming gray, about $\frac{1}{4}$in. long; centrals 3–4, similar, only somewhat stouter and darker: fls. usually abundant, straight or slightly S-shaped, 4–5 in. long, scarlet-red: fr. spherical, reddish green, covered with bristles. Southern Mex. B.M. 3768.

BB. *Ribs of stem 3–5.*

54. **nycticàlus**, Link. NIGHT-BLOOMING CEREUS. Suberect, very long-jointed, $\frac{1}{2}$–1 in. in diam.: joints variable, some cylindrical, others 4–6-angled: ribs acute at first, obtuse later: spines 1–4, and very small: fls. white and fragrant, about 7 in. long. Mex.—The commonest Night-blooming Cereus.

55. **inérmis**, Otto. Sts. branching, climbing, branches 4–5-angled, sharp-winged, yellowish green, later darker, slightly crenate: areolæ in the depressions, small, bearing a few bristles when young, but soon naked. Venezuela.

56. **hamàtus**, Scheidw. (*C. rostràtus*, Lem.). Stems slender, weak, climbing, bright green, less than 1 in. in diam., reaching a length of 10 ft.: ribs remotely serrate, the serrations repand, and bearing on their anterior edge the small areolæ: spines 5–6, bristle-form, whitish to brown, very short and partly deciduous: fls. large, 10–16 in. long and nearly the same in diameter, white, nocturnal. Central Mexico.



415. Cerinthe retorta. (× ½.)

57. **Régelii**, Hort. This form is very common in the trade; is a very excellent climbing plant, with good, fixed characters; is a slender climbing plant. Its origin is obscure, but, from its vegetative characters, as well as floral, it is apparently closely related to either *C. hamatus* or *C. MacDonaldiæ*, with one of which it may be a hybrid.

58. **Napoleònis**, Graham. Suberect and long-jointed, the joints 3-angled and with flat sides, 12 in. or more long, $\frac{3}{4}$–1 in. in diam.: spines 3 or 4, subulate, unequal, black; sometimes a few white bristles: fls. snowy white, 8 in. long and 6 in. broad: fr. bluish and spiny, 3 by 4 in. W. Ind., Mex. B.M. 3458.

59. **exténsus**, Salm-Dyck. Climbing: stems richly branching, about 3 ft. long by about $\frac{3}{4}$in. in diam., dark green, soon becoming covered with gray-yellow, corky flakes: 3-angled, angles blunt, later becoming depressed, so that the older stems are cylindrical: areolæ $\frac{1}{2}$–$2\frac{1}{2}$ in. apart, white, becoming gray: spines 2–4, very short and strong, straight or very slightly curved, dark brown, becoming gray with age: fls. from the sides of the branches, 8–9 in. long, rose-red. Trinidad. B.M. 4066.

60. **triangulàris**, Haw. Stems jointed, long and slender, climbing: ribs 3, compressed, thin, and about 1 in. or more high, crenate, with a corneous margin connecting the areolæ: areolæ about 1–$1\frac{1}{2}$ in. apart: radial spines 2–4, bristle-form, short, soon deciduous; centrals 1–3, conical from a bulbous base, dark colored: fls. large, about 1 ft. long by about the same diameter when fully open, white, nocturnal, tube covered with large, leaf-like scales: fr. large, covered with the persistent large scales. Mexico and West Indies. B.M. 1884 Mn. 6:5.—The fruit is edible and very refreshing, and is common in the Mexican markets.

BBB. *Ribs inconspicuous or wholly absent.*

61. **MacDónaldiæ**, Hook. Climbing, and of rapid growth, richly branching, branches very long, cylindrical or with here and there very obtuse and not continuous angles, dark green: areolae elevated on tubercles which are arranged spirally on the branches, small: spine solitary (or rarely 2), short, porrect, brown or black, inconspicuous: fls. lateral, about 14 in. long, white, nocturnal. Honduras. B.M. 4707.

The following horticultural names, in the Amer. trade, are not accounted for in the foregoing synopsis: *C. Chìldsii*, *C. diversispìna*, *C. eréctus*, *C. farinòsus*, *C. frágilis*, *C. Gèbseri*, *C. Guadalupànus*, *C. Zaucacàri*.

The following names, in the Amer. trade, belong to Echinocereus: *C. Berlandièri*, *C. cæspitòsus*, *C. chloránthus*, *C. coccíneus*, *C. conoídeus*, *C. ctenoìdes*, *C. dasyacánthus*, *C. dùbius*, *C. Engelmanni*, *C. enneacanthus*, *C. Féndleri*, *C. gonacánthus*, *C. longisètus* *C. Mojavénsis*, *C. paucispìnus*, *C. pectinàtus*, *C. phœníceus*, *C. procúmbens*, *C. Rœtteri*, *C. Scheèri* (Schlini), *C. stramíneus*, *C. tuberòsus*, *C. viridiflòrus*.

C. cylíndricus is Opuntia. *C. Nickelsii* and *C. senílis* are Pilocereus.

JOHN M. COULTER and
C. H. THOMPSON.

CERÍNTHE (Greek, *keros*, wax; *anthos*, flower: the ancients believed that the bees visited the flowers for wax). *Boraginàceæ.* About 6 species of annual or perennial herbs from Europe and Asia Minor, with alternate, glaucous lvs. and showy purple bracts. The best species is *C. retorta*, which has a unique appearance in the garden, and is strongly recommended for more general cultivation. It is a hardy annual of easy culture. For a garden review of the other Honeyworts, see Gn. 41, p. 212.

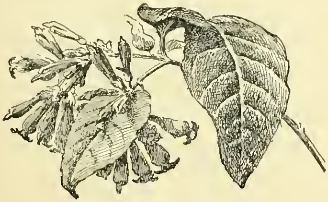
retórta, Sibth. & Sm. HONEYWORT. Fig. 415. Height $1\frac{1}{2}$–2 ft.: lvs. glaucous, often spotted white or red; lower lvs. obovate-spatulate; upper lvs. amplexicaul, with 2 round ears, on the flowering branches gradually becoming smaller and closer together until they pass into purple bracts, which form the chief attractive feature of the plant: fls. when full-blown protruded beyond the bracts: corolla tubular-club-shaped, yellow, tipped purple, with 5 small, spreading teeth. Greece. B.M. 5264. Gn. 41:847.

W. M.

CEROPÈGIA (Greek, *wax* and *fountain*, the flowers having a waxy look). *Asclepiadàceæ.* Greenhouse vines of Africa and Asia, not in the Amer. trade. A dozen species are known in Old World collections. Many of them have tuberous roots, and need a season of rest and dryness. Prop. by cuttings. Odd and handsome.

CERÓXYLON NIVEUM, Hort.=Diplothemium.

CÉSTRUM (old Greek name). Syn., *Habrothámnus*. *Solanàceæ*. Greenhouse shrubs of many species, in tropical Amer. Some of them have a climbing habit. The tubular fls. are in axillary or terminal cymes, red, yellow, greenish or white, often very fragrant. Lvs. alternate and entire, usually rather narrow. Fruit a berry. Cestrums are among the most useful of bright-flowering, shrubby, greenhouse plants, and they may be grown either as pot plants, or planted out against the back wall or supports of a greenhouse, where, if given a light position, they will produce an abundance of flowers from January to April. The Mexican species will do well in a winter temperature of 45° to 50°, but the species from Central America require stove temperature. They are propagated by cuttings taken in February or early in March, and inserted in sand in a warm temperature, keeping them somewhat close until rooted, when they should be potted in a light soil, after which they may be grown in pots, shifting on as often as required, or planted out in the open ground towards the end of May in a sunny position, where, if kept pinched back to induce a bushy growth and attention is paid to watering, they will make fine plants by the first of September. They should then be lifted and potted in a light, rich soil and kept close and shaded for a few days, and then transferred to their winter quarters. After flowering, the plants should be given a rest for a month or six weeks, gradually reducing the supply of water to induce the leaves and wood to ripen, after which they should be cut well back, the old soil shaken off, and the roots trimmed back, and then either potted again or planted out for the summer. While in the greenhouse, Cestrums are very subject to the attacks of insects, especially the mealy bug (*Coccus adonidum*). To keep these in check they should be given an occasional spraying of kerosene emulsion. The Cestrums are much grown in warm countries, and they bloom continuously. Following are the only species known to be in the Amer. trade:



416. Cestrum elegans (× ½).

A. *Fls. red.*

élegans, Schlecht. (*Habrothámnus élegans*, Brongn.). Fig. 416. Tall and slender, half-climbing, the branches pubescent: lvs. ovate, lanceolate, long-acuminate, of medium size, pubescent beneath: fls. red-purple, swollen near the top of the tube, in loose clusters, which nod at the ends of the branches, the lobes ciliate. Mex. F.S. 2:82.—One of the commonest and best of greenhouse shrubs, blooming almost continuously. There is a form with variegated lvs.

fasciculàtum, Miers. Spring bloomer, with larger fls. than those of *C. elegans*, and more compact, nearly globular fl.-clusters, the cluster subtended by small lvs. as if an involucre: lvs. ovate. Mex. B.M. 4183 (and probably the *C. elegans*, B.M. 5659.)

Néwelli, Hort. (*H. Néwelli*, Veitch). Fls. bright crimson, larger and more brilliant than those of *C. elegans* and *C. fasciculatum*. Gn. 34:660.—A free-growing plant, originating from seed by Mr. Newell, Downham Market, Eng. Evidently an offshoot of one of the preceding species.

AA. *Fls. Orange.*

aurantìacum, Lindl. Of half-climbing habit: lvs. oval to ovate, more or less undulate: fls. sessile, in a panicle, orange-yellow. Guatemala. R.H. 1858, p. 238.

AAA. *Fls. white, greenish, or cream-yellow.*

Párqui, L'Her. Shrub, half-hardy: lvs. lanceolate, petioled, short, acuminate: fls. long, tubular, with a wide-spreading limb, in an open panicle, greenish yellow, very fragrant at night. Chile. B. M. 1770.

diúrnum, Linn. Quick-growing evergreen shrub: lvs. oblong and short-acute, thickish and glabrous, shining above: fls. white, very sweet-scented by day, in axillary long peduncled spikes: fr. white. W. Ind.

noctúrnum, Linn. Shrub 6–9 ft.: branches brownish, very slender or flexuose, glabrous or nearly so: lvs. thinner, ovate or elliptic, prominently acuminate: fls. creamy yellow, very fragrant by night. Jamaica.

E. J. CANNING and L. H. B.

CHÆNÁCTIS (Greek, *gaping ray*: the marginal corollas often ray-like). *Compósitæ*. West American herbs or under-shrubs, with alternate and mostly dissected lvs., and yellow, white or flesh-colored fls. on solitary peduncles or in loose cymes. Florets of one kind, but the marginal ones with a more or less enlarged limb: involucre campanulate: receptacle flat and generally naked: pappus of scales (wanting in 1 species). Three species have been introduced as border plants, but they are little known to gardeners. Of easy culture. Prop. by seeds or division.

A. *Pappus of entire or nearly entire persistent scales.*

tenuifòlia, Nutt. Small, tufted annual, white pubescent when young but becoming nearly or quite glabrous: 1 ft.: lvs. once or twice pinnately parted, the lobes linear or filiform: heads ⅓in. high, lemon-yellow. S. Calif.

Doùglasii, Hook. & Arn. Biennial or perennial, 3–15 in. high, usually white-woolly when young: lvs. broad, pinnately parted into short and crowded, obtuse lobes: heads ½–¾in. high, white or whitish. Mont. S. and W. —Variable.

AA. *Pappus of fimbriate and deciduous scales, or even wanting.*

artemisiæfòlia, Gray. Tufted annual, 1–2 ft., rusty-pubescent and somewhat sticky: lvs. 2 or 3, pinnately parted into short-linear or oblong lobes: heads ½ in. high, the involucre viscid, the florets white or cream-color. S. Calif.

L. H. B.

CHÆNOMÈLES. *Cydonia.*

CHÆNOSTÒMA (*gaping mouth*, in allusion to the shape of the corolla). *Scrophulariàceæ*. About 30 African herbs or sub-shrubs, with simple lvs. mostly opposite, and axillary or terminal-racemose, showy fls.; stamens 4, in 2's, attached to the throat of the corolla, more or less exserted: style filiform and club-shaped, and obtuse at the apex: corolla tubular, swollen in the throat, with a 5-lobed spreading limb.

híspidum, Benth. Small perennial, with opposite, oval or oblong-toothed lvs., and blush-white, star-like fls. ¼ in. across, in dense clusters. S. Afr. J.H. III. 33:636. —An old and deserving greenhouse or pot plant, but rarely seen at present. It blooms almost continuously, the fls. sometimes hiding the foliage. Prop. by seeds or cuttings, either in fall or spring. Begins to bloom when 4–6 in. high. To be recommended for windows, and for summer vases.

CHAMÆBÀTIA (Greek, *dwarf*, and *bramble*, alluding to its bramble-like fls.). *Rosàceæ*. Low shrub, clothed with glandular pubescence: lvs. alternate, stipulate, tripinnatifid, persistent: fls. in terminal corymbs, white, with 5 petals and numerous stamens: fr. a small akene. One species in Calif. Ornamental shrub of agreeable aromatic odor, with graceful foliage and showy white fls. in June and July; hardy only in warmer temperate regions. It thrives best in sandy, well-drained soil and sunny position. Prop. by seeds sown in spring and by greenwood cuttings under glass.

foliolòsa, Benth. Two to 3 ft.: lvs. nearly sessile, oval or ovate-oblong, closely tripinnately dissected, 1½–2½ in. long: fls. white, ¾ in. wide, in 4–8-fld. corymbs. B.M. 5171.

ALFRED REHDER.

CHAMÆBATIÀRIA. See *Sorbaria.*

CHAMÆCÉRASUS. See *Lonicera.*

CHAMÆCÝPARIS (*chamai*, dwarf, and *kuparissos*, Cypress; referring to its affinity). *Coníferæ.* Evergreen trees, with opposite, scale-like lvs. in 4 rows, densely clothing the compressed branchlets: fls. monœcious, small; pistillate inconspicuous, globose; staminate yellow or red, oblong, often conspicuous by their abundance: cones small, globular, with 6–8 bracts, each bearing 2 or rarely 5, winged seeds, ripening the first season. Closely allied to Cupressus, which differs by its larger cones maturing the second year, the bracts containing 4 or more seeds, and by its quadrangular branches and minutely denticulate lvs. Five species in N. Amer. and Japan, all very valuable timber trees in their native countries. Highly ornamental evergreen trees of pyramidal habit, of which only *C. sphæroidea* is fully hardy north, while the Japanese species are hardy in sheltered positions north to New England, and *C. Lawsoniana* only from New York south. They grow best in somewhat moist but well-drained, sandy loam and in a partly shaded position, sheltered against dry winds. *C. Lawsoniana* and *C. obtusa* like more dry, the others more moist situations, and *C. sphæroidea* grows well even in swamps. Prop. by seeds, sown in spring; increased also by cuttings from mature wood in fall, inserted in a sandy soil and kept in a coolframe or greenhouse during the winter; if in early spring gentle bottom heat can be given, it will hasten the development of roots considerably. All the so-called Retinosporas and the dwarfer forms, and most of the varieties of *C. Lawsoniana*, are readily increased in this way, while the typical forms of *C. Nutkaensis, obtusa* and *sphæroidea* do not grow well from cuttings; therefore for most varieties veneer grafting on seedling stock during the winter in greenhouse is preferred, but dwarf forms always should be grown from cuttings, as they often lose their dwarf habit if grafted. The so-called Retinosporas of the gardens, with linear, spreading lvs., are juvenile forms, which have retained the foliage of the seedling state. There are similar forms in Thuya. For their distinguishing characters, see *Retinospora.* For the numerous garden forms, see Beissner, Handb. der Nadelholzk., pp. 64–99.

417. Chamæcyparis pisifera.

418. Chamæcyparis pisifera, var. plumosa.

A. *Lvs. green on both sides or paler beneath.*

sphæroidea, Spach (*Cupréssus thuyoìdes*, Linn.). WHITE CEDAR. Tree, to 70 or 80 ft., with erect, spreading branches: branchlets irregularly arranged, spreading, not pendulous, very thin and slender, flattened: lvs. closely imbricate, glaucous or light green, with a conspicuous gland on the back, fragrant: cones small, ¼ in. in diam., bluish purple, with glaucous bloom. From Maine to Florida, west to Mississippi. S.S. 10:529.—Var. **ericoìdes**, Beissn. & Hochst. (*C. ericoìdes*, Carr. *Retinóspora ericoìdes*, Hort.). Compact shrub, of erect, dense habit: lvs. linear-lanceolate, spreading, with two glaucous lines beneath, coloring in winter usually reddish brown. Var. **Andelyénsis**, Carr. (*Retinóspora leptoclàda*, Hort.). Intermediate form between the former and the type; bluish green, and of erect growth, with loosely appressed, lanceolate lvs.; often some branchlets with lvs. of the type and some with lvs. of the var. *ericoides.* R.H. 1869, p. 32, and 1880, p. 36. Var. **glaùca**, Endl. (var. *Kewénsis*, Hort.). Of compact habit, very glaucous, with silvery hue. Var. **variegàta**, Hort. Branchlets partially colored golden yellow.

Nutkaénsis, Spach (*Cupréssus Nootkaténsis*, Lamb. *Thuyópsis boreàlis*, Hort.). YELLOW CEDAR. Tree, to 120 ft., with ascending branches, pendulous at the extremities: branchlets distichously arranged, slightly flattened or nearly quadrangular, pendulous: lvs. densely imbricate, usually dark green, acute, mostly without glands: cones subglobose, nearly ½ in. in diam., dark red-brown, with glaucous bloom. From Sitka to Oregon. S.S. 10:530. R.H. 1869, p. 48.—Var. **glaùca**, Hort. With very glaucous foliage. Var. **péndula**, Hort. Distinctly pendulous. There are some forms with variegated lvs.

Gn. 50, p. 68. *C. Nutkaensis* is about as hardy as the Japanese species.

AA. *Lvs. with glaucous or whitish marks beneath: branches with horizontally spreading ramifications.*

Lawsoniàna, Parl. (*Cuprèssus Lawsoniàna*, Murr.). Tree, to 200 ft., with horizontally spreading and usually pendulous branches: branchlets frond-like arranged, flattened: lvs. closely appressed, obtuse or somewhat acute, usually bright green, with a gland on the back: staminate catkins bright red (yellow in all other species): cone globose, about ⅓in. across, red-brown and often glaucous. From Oregon to Calif. S.S.10:531. Gng.2:327. —This is one of the most beautiful Conifers and very variable, about 60 garden forms being cultivated in European nurseries and collections. The following are some of the best: Var. **álbo-spìca,** Hort. Tips of branchlets creamy white, of slender habit. Var. **Álumi,** Hort. Of columnar habit, foliage very glaucous, with a bluish metallic hue. The best blue columnar form. Var. **argéntea,** Hort. Of slender habit, with very glaucous, almost silvery foliage. Var. **erécta viridis,** Hort. Dense, columnar habit and bright green foliage. One of the most beautiful varieties, but somewhat tender. Var. **erécta glaùca,** Hort. Similar in habit, but with glaucous foliage. Var. **filifòrmis,** Hort. Branches elongated, somewhat pendulous, with few lateral branchlets, of low, globular habit. Var. **glaùca,** Hort. Foliage of metallic glaucous tint. One of the hardier forms. Var. **grácilis,** Hort. (var. *gracilis pendula*, Hort.). Elegant light green form, with graceful, pendulous branchlets. Var. **intertéxta,** Hort. Glaucous form, of vigorous growth, with remote, pendulous branches and distant, thickish branchlets. Var. **lùtea,** Hort. Of compact habit, young growth clear yellow. G.C. III. 20:721. Var. **nàna,** Hort. Dwarf, globose habit; with some variegated and glaucous forms. There are also different variegated forms with the habit of the type.

419. Chamæcyparis pisifera, var. squarrosa.

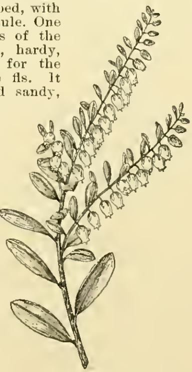
obtùsa, Sieb. & Zucc. (*Cuprèssus obtùsa*, Koch. *Retinóspora obtùsa*, Sieb. & Zucc.). Hinoki Cypress. Tree, to 120 ft., with horizontal branches: branchlets frond-like arranged, flattened, pendulous: lvs. bright green and shining above, with whitish lines beneath, thickish, obtuse, and very closely appressed, with a gland on the back: cones globose, nearly ½in. in diam., brown. Japan. S. Z. 121. G.C. II. 5:236 R. H. 1869, p. 97.—Var. **álbo-spìca,** Hort. Tips of branchlets whitish. Var. **aùrea,** Hort. Golden yellow. Var. **breviràmea,** Rehder (*C. breviràmea*, Max. Var. *filicoìdes*, Hort.). Of slow growth, with short and densely frond-like arranged branchlets. G.C. II, 5:235. Var. **grácilis aùrea,** Hort. Graceful form, foliage bright golden yellow when young, changing later to greenish yellow. Var. **lycopodioìdes,** Carr. Low form, of somewhat irregular habit, with spreading, rigid branches and thick, nearly quadrangular, dark green branchlets. Var. **nàna,** Carr. Low form, of slow growth, with short, deep green branchlets. Var. **péndula,** Beissn. (*C. pendula*, Maxim.). Branches elongated, thick and thread-like, pendulous, with few distant branchlets. Var. **pýgmæa,** Carr. Very dwarf form, with horizontal, almost creeping branches, densely frond-like branched. Exceedingly interesting form for rockeries.

pisifera, Sieb. & Zucc. (*Cuprèssus pisìfera*, Koch. *Retinóspora pisìfera*, Sieb. & Zucc.). Sawara Cypress. Fig. 417. Tree, to 100 ft., with horizontal branches: branchlets flattened, distichously arranged and somewhat pendulous: lvs. ovate-lanceolate, pointed, shining above, with whitish lines beneath: cones globular, ¼–⅓ in. in diam., brown. S.Z. 122. G.C. II. 5:237. —This is, next to *C. sphæroidea*, the hardiest species, and some varieties are much cultivated, while the type is less planted. Var. **aùrea,** Hort. Yellow foliage. Var. **filifera,** Hort. (*Retinospora filifera*, Hort. *C. obtusa filifera*, Hort.). Branches elongated and slender, thread-like, gracefully pendulous, with distant branchlets and lvs. Very decorative forms. G.C. II. 5:237. Var. **plumòsa,** Hort. Fig. 418. Of dense, conical habit: branches almost erect, with slender branchlets of feathery appearance: lvs. subulate, pointed and slightly spreading, bright green. Intermediate between the type and var. *squarrosa*. G.C. II. 5:236. Var. **plumòsa argéntea,** Hort. Tips of branchlets whitish. Var. **plumòsa aúrea,** Hort. Young growth of golden yellow color. A very showy form. Var. **squarròsa,** Beissn. & Hochst. (*Retinospora squarrosa*, Sieb. & Zucc. *R. leptoclada*, Zucc.). Fig. 419. Densely branched, bushy tree or shrub, with spreading, feathery branchlets: lvs. linear, spreading, glaucous above, silvery below. A very distinct and beautiful variety. S.Z. 123. R.H. 1869, p. 95, and 1880, p. 37.

Alfred Rehder.

CHAMÆDÁPHNE (*chamai*, dwarf, and *daphne*, the laurel in ancient Latin, alluding to its dwarf habit and evergreen lvs.). Syn., *Cassándra*. *Ericàceæ*. Leather Leaf. Low shrub with evergreen, alternate small lvs.: fls. nodding in terminal, leafy racemes: corolla urceolate-oblong, 5-lobed, with 5 included stamens: fr. a capsule. One species in the colder regions of the northern hemisphere. Low, hardy, ornamental shrub, valuable for the earliness of its pretty white fls. It thrives best in a peaty and sandy, moist soil. Prop. by seeds sown in sandy peat, only slightly or not covered, and kept moist and shady; also by layers and suckers and by cuttings from mature wood in late summer under glass.

calyculàta, Mœnch (*Cassándra calyculàta*, Don). Fig. 420. Shrub with spreading or horizontal branches, 1–3 ft.: lvs short-petioled, oblong, obtuse, slightly serrulate and revolute at the margins, dull green above and rusty-lepidote beneath: fls. short-peduncled, nodding; corolla white, oblong, about ¼ in. long. B.M. 1286. L. B. C. 6:530; 15:1464; 16:1582. Em. 423.—Var. **angustifòlia,** Gray. Lvs. linear-lanceolate, undulate and crisped at the margin. Var. **nàna,** Lodd. One foot or less high, with horizontal branches. L.B.C. 9:862.



420. Chamædaphne calyculata (× ⅓).

Alfred Rehder.

CHAMÆDORÈA (Greek, *dwarf* and *gift*). *Palmàceæ*, tribe *Arèceæ*. Spineless, erect, procumbent or rarely climbing palms, the trunks solitary or cespitose, slender or reed-like. Lvs. simple, bifid at the apex or variously equally-pinnatisect: lobes broad or narrow, straight or oblique, acuminate, plicate-nerved, usually callous at the base, the basal margins folded back or recurved: petiole usually cylindrical; sheath tubular, oblique at the throat; spadices among or below the lvs., simple or paniculately branched; spathes 3 or many, alternate, sheathing, elongated, split at the apex, membranous or coriaceous, usually persistent: pistillate fls. very small: fr. small, of 1–3 globose or oblong-obtuse carpels, coriaceous or fleshy. Species about 60. Mex. to Panama.

Peat or leaf-mold, loam and sand in equal parts, with a little charcoal added, form the best soil. The species common in cultivation are quick-growing. They are well suited for planting out in greenhouse borders. The sexes are on different plants, therefore several should be planted in a group if the handsomely colored fruit is desired. All of the kinds require warm temperature in winter. Increased from seeds. Of the many species, only the following appear in the Amer. trade:

A. *Lvs. simple.*

élegans, Mart. Stem strict, 6 ft., closely ringed: lvs. narrowly lanceolate, acuminate, straight: fr. globose. Mex. G.C. I. 33:508.

Ernesti-Augústi, Wendl. Stem 3–4 ft., reedy, erect, radicant at base; blade obovate, cuneate at the base, deeply bifid, coarsely serrate along the margins; petiole shorter than blade; sheath amplexicaul; sterile spadix 8–9 in., the simple branches 6–8 in., attenuate, slender: fertile spadix simple: fls. red. Venezuela. B.M. 4837. G.C. I. 33:508.

AA. *Lvs. pinnate.*

B. *Plant becoming of climbing habit.*

desmoncoìdes, H. Wendl. Lvs. 2–3 ft. long, with drooping, narrow lfts. a foot long, and glaucous petiole: plant tending to climb after it becomes a few feet high. Mex.

BB. *Plant not climbing.*

C. *Stem or trunk evident.*

Sártorii, Liebm. Stem 8–14 ft., ringed, clothed above with leaf-sheaths: lvs. 3–3½ ft. long; petiole terete, sulcate, dilated at the base; sheath, petiole and rachis white on the back; lfts. 12 in. long, 1½–2 in. wide, alternate, falcate, acuminate, narrowed at the base. Mex.

Tepejilòte, Liebm. Stem 4–6 ft. high, closely ringed: lvs. 4 ft.; lfts. 1-nerved, close, alternate, falcate, acute, narrowly lanceolate, 13–15 in. long, 1½ in. wide: rachis convex on the back, canaliculate above. Mex. B.M. 6030.

glaucifòlia, H. Wendl. Stem 20 ft.: lvs. long, pinnate; lfts. narrowed, long and slender, dark green, glaucous. Guatemala. G.F. 8:507.

Arenbergiàna, H. Wendl. (*C. latifòlia*, Hort.). Stem slender, 5–6 ft., green: lvs. erect-spreading; lfts. 10–15 pairs, alternate and drooping, very long-pointed, plicate and many ribbed. Guatemala. B.M. 6838.

CC. *Stem or trunk none.*

Príngleì, Wats. Acaulescent or nearly so; lvs. erect, pinnate, 3 ft.; lfts. 12–15 on each side, linear-lanceolate, acuminate, 6–8 in. long, ¼–⅓ in. wide; rachis triangular; spadix simple, 8 in. long. San Louis Potosi, Mex

JARED G. SMITH and G. W. OLIVER.

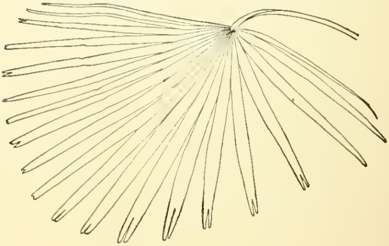
CHAMÆPEÙCE. Now referred to *Cnicus*.

CHAMÆRÁNTHEMUM (*dwarf* and *flower*, from the Greek). *Acanthàceæ*. Three or 4 Brazilian small herbs, allied to Eranthemum, but readily distinguished by the 4 (instead of 2) stamens. Lvs. large and membranaceous, entire, variously marked. Fls. showy, white or yellow, in bracteate clusters. Grown chiefly for the beautiful foliage. **C. ìgneum**, Regel (*Eránthemum ìgneum*, Lind.), is in the Amer trade. It is a low, spreading, warmhouse plant (culture of Eranthemum and Justicia), with dark green lvs. and veins, richly banded with orange or yellow. Fls. small. F.S. 17:1722.

CHAMÆROPS (Greek for *dwarf bush*). *Palmàceæ*, tribe *Corýpheæ*. Low, fan-leaved palms, with cespitose caudices branched from the base and clothed with the bases of the leaf-sheaths. Lvs. terminal, rigid, semi orbicular or cuneate-flabillate, deeply laciniate, the lobes narrow, bifid, plicate; no rachis; ligule very short; petiole slender, bi-convex, the margins smooth or rough; sheath split, reticulate, fibrous; spadices short, erect compressed: branches short, densely flowered: spathes 2–4, broad, thickly coriaceous, the lower ones split, the upper entire; bracts small, subulate; bractlets none: fls. small, yellow: fr. globose or ovoid, 3-sided toward the base, brown or yellow. Species 2. Mediterranean region. The common *C. humilis* is widely cult., and very variable. Many of the specific-made names of the genus are forms of this species. Of such cases are evidently the garden names *C. arborescens*, *argentea*, *Canariensis*, *elata*, *elegans*, *farinosa*, *gracilis*, *littoralis*, *nivea*.

Fibrous loam two parts, leaf-mold and sand one part, with good drainage. Prop. by suckers and by seeds. These are among the hardiest of all palms, and are well suited to greenhouses where a high temperature is not kept up.

hùmilis, Linn. (*Phœnix Hanceàna*, Hort.). Fig. 421. Stem 1–1½ ft. high: lvs. ragged, fibrous; margins of the petioles armed with stout, straight or hooked spines; blade suborbicular, truncate or cuneate at the base, rigid, palmately multifid; segments acuminate, bifid. Mediterranean. B.M. 2152. R.H. 1892:84 (showing habit and a colored plate of the fruit). Reaches 20 ft.



421. Chamærops humilis.

C. Bíroo, Sieb.=Livistona rotundifolia.— *C. Býrrho*, Hort.=Livistona rotundifolia.—*C. excélsa*, Thunb.=Trachycarpus excelsus.— *C. Fórtunei*, Hook.=Trachycarpus.— *C. hùmilis* × *Hýstrix*, Hort. Said to be a "choice garden hybrid of Florida origin."— *C. Hýstrix*, Fras.=Rhapidophyllum Hystrix.— *C. stauracantha*, Hort.=Acanthorhiza aculeata.

JARED G. SMITH and G. W. OLIVER.

CHAMOMILE. Consult *Anthemis*

CHAPMAN, JONATHAN. See *Appleseed, Johnny.*

CHAPTÀLIA (J. A. C. Chaptal, agricultural chemist). *Compósitæ*. American low perennial herbs, with white or purplish fls. on naked scapes, blooming in spring and summer. Heads radiate, the ray-fls. pistillate, and the disk-fls. perfect, but some or all of them sterile: involucre campanulate or turbinate, of appressed and imbricated bracts: pappus of soft capillary bristles: akenes oblong or fusiform, narrowed above, 5-nerved. The only species in the Amer. trade is **C. tomentòsa**, Vent., of N. Car. and S. Of this the scape is 1 ft. or less high, and the heads are purple-rayed: lvs. spatulate or lanceolate, entire or nearly so, rather thick, white tomentose beneath. Introduced as a border plant.

CHARD (*ch* pronounced as in *charge*). A form of the plant (*Beta vulgaris*) which has produced the common beet. Often known to horticulturists as *Beta Cycla.*

See *Beet* and *Beta*. The beet plant has given rise to two general types of varieties: those varieties with thickened roots (the beet of America, the beet-root of European literature); and those with large and pulpy or thickened leaves (but whose roots are small and woody). The latter type is known under the general name of leaf-beets. These leaf-beets may be ranged into three sub-groups: (1) common or normal leaf-beets, or spinach beets, in which the leaf-blade is large and pulpy, and is used as spinach is; (2) Chard, in which the petiole and midrib are very broad and thick (Fig. 422); (3) ornamental beets, of which the foliage is variously colored.

422. Chard, or Sea-Kale beet.

Chard is of the easiest culture. Seed is sown in spring, as for common beets. The broad petioles, or Chards, may be gathered from midsummer until frost. These broad white stalks or ribs are used as a pot-herb; and, if desired, the leaf-blades may be cooked with them. The dish is usually more attractive, however, if only the Chards are cooked. This vegetable is also known as Sea-kale Beet and Swiss Chard. L. H. B.

CHARLOCK. Consult *Brassica;* also *Raphanus.*

CHASTE TREE. See *Vitex.*

CHEAT, or CHESS. *Bromus.*

CHECKERBERRY. *Gaultheria.*

CHEESES. Vernacular for *Malva rotundifolia.*

CHEILÁNTHES (Greek, *lip-flower*, alluding to the indusium). *Polypodiàceæ.* Semi-hardy or hothouse ferns of small size, often hairy or woolly, with the sori terminal on the veins and covered with a roundish indusium. Some 60 or 70 species are known, nearly a third of which are natives of the west and southwest, one species as far east as Connecticut. They are of easy culture, enjoying a position near the glass, and disliking strong, close heat and syringing or watering overhead.

A. *Lvs. pentagonal-deltoid, the indusium confined to a single veinlet.*

Califórnica. Mett. (*Hypólepis Califórnica*, Hook.). Lvs. densely cespitose from a short creeping rootstock 2–4 in. each way, on stems 4–8 in. long, quadripinnatifid; ultimate segments lanceolate, incised or serrate. Calif.

meifòlia, D. C. Eaton. Lvs. cespitose, with slender brown stems 5–7 in. long, the lamina 2–3 in. each way, 3–4-pinnatifid, with finely cut segments 1-10 of an in. wide. Mex.

AA. *Lvs. ternately divided, with dark polished stems.*

pedàta, A. Br. Lvs. cespitose, on long (9–12 in.) stems, about 6 in. either way, the 3 divisions bipinnatifid; sori numerous, placed on both sides of the segments. Jamaica, Cuba.

AAA. *Lvs. lanceolate or ovate-lanceolate.*

B. *Segments flat: indusia extending over the apices of several veinlets, but not continuous.*

C. *Surface of lvs. smooth.*

microphýlla, Swz. Lvs. 4–10 in. long, on stems nearly as long, from a short, creeping rootstock, bi-tripinnate: stems glossy, rusty-pubescent on the upper side. Fla. and New Mex. southward.

CC. *Surface of lvs. viscid-glandular.*

víscida, Davenp. Lvs. 3–5 in. long, on stems of the same length, tripinnatifid; segments toothed, everywhere glandular. Calif.

CCC. *Surface of lvs. hairy, not woolly.*

hírta, Swz. Lvs. densely cespitose, with short, scaly stems which are brownish, like the rachides; pinnæ numerous, rather distant bipinnatifid, the segments with much incurved margins. The lvs. are usually 6–15 in. long. Cape of Good Hope.—Var. **Ellisiàna** is more commonly cult.

lanòsa, Wats. (*C. vestìta*, Swz.). Fig. 423. Cespitose, with stems 2–4 in. long, slightly hairy, as are the segments: lvs. tripinnatifid, 4–10 in. long, 1–2½ in. wide, the pinnæ lanceolate-deltoid: indusia formed of the ends of roundish or oblong lobes. Conn. to Kan. and Ala.—Hardy.

Coòperæ, D. C. Eaton. Lvs. 3–8 in. long, bipinnate, the stems covered with nearly white hairs, each tipped with a gland; pinnules roundish ovate, crenate and incised. Calif. to Mex.

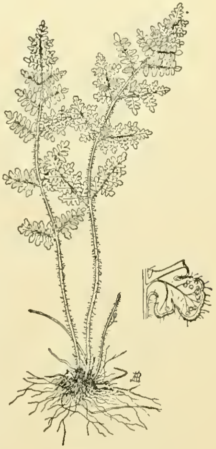
BB. *Segments bead-like, minute: indusium usually continuous.*

D. *Lvs. hairy or woolly beneath, but not scaly.*

E. *Upper surface of segments smooth.*

gracíllima, D. C. Eaton. LACE FERN. Lvs. cespitose, 1–4 in. long, besides the nearly equal dark brown stems, bipinnate; pinnæ with about nine pinnules, finally smooth above. Idaho to Calif.—Hardy.

Clèvelandii, D. C. Eaton. Lvs. 4–8 in. long, tripinnate, dark brown beneath, with closely imbricate, ciliate scales, which grow on both the segments and the rachides; segments nearly round, the terminal larger. Calif.


423. Cheilanthes lanosa. (×⅓.)

EE. *Upper surface of segments pubescent.*

tomentòsa, Link. Lvs. 8–15 in. long, on stems 4–6 in. long, everywhere covered with brownish white hairs, tripinnate; terminal segments twice as large as the lateral. Va. to Ariz.

DD. *Lvs. covered beneath with scales, but not woolly.*

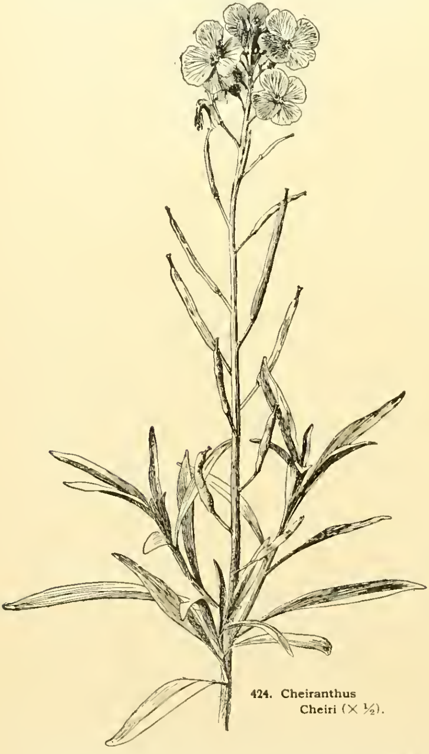
Féndleri, Hook. Lvs. 3–6 in. long besides the chaffy stems, rising from tangled, creeping rootstocks, tripinnate: rachides with broadly-ovate white-edged scales, which overlap the subglobose segments. Tex. and Colo. to Calif.

DDD. *Lvs. covered beneath with both scales and wool.*

myriophýlla, Desv. (*C. élegans*, Desv.). Lvs. densely cespitose from short, erect, scaly rootstocks, 3–9 in. long, beside the chestnut-colored scaly stems; tri-quadripinnatifid: ultimate segments minute, innumerable. Tex., Ariz. and Trop. Amer.

Another native species worthy of cultivation is *C. leucopòda*, Link, from Tex., with broadly deltoid-ovate leaves. L. M. UNDERWOOD.

CHEIRÁNTHUS (derivation in dispute, but probably from Greek for *hand* and *flower*). *Cruciferæ.* A dozen or more Old World herbs, with large purple or yellow fls., entire lvs., and a strict or upright habit. Lateral sepals sac-like at the base: valves of the pod with a strong midnerve. Much confounded with Matthiola, and the genera are not sufficiently distinct. In Cheiranthus, the lvs. are acute, stigma more spreading, pod more flattened and seeds not thin-edged.


424. Cheiranthus Cheiri (× ½).

Cheiri, Linn. WALLFLOWER. Fig. 424. Perennial, slightly pubescent, 1–2½ ft.: lvs. lanceolate and entire, acute: fls. large, mostly in shades of yellow, in long, terminal racemes. S. Eu.—An old garden favorite, blooming in spring. Although a woody perennial, it is best to renew the plants from seed, for they begin to fail after having bloomed one or two years. Seedlings should bloom the second year. There are dwarf and double-fld. varieties, and innumerable forms in various shades of yellow, brownish, and even purple. Not prized so much in Amer. as in Eu. It thrives in any good garden soil.

C. ánnuus, Hort.=Matthiola, but early-blooming forms of C. Cheiri seem to pass under this name.—*C. Ménziesii*, Benth. & Hook.=Parrya. L. H. B.

CHELIDÒNIUM (Greek for the *swallow:* the fls. appear when the swallow comes). *Papaveràceæ.* CELANDINE. One or two loose-growing herbs, with fl.-buds nodding, and small yellow fls. in small umbel-like clusters: sepals 2; petals 4; stamens 16–24: style very short, the stigma 2-lobed; pod slender, 2-valved, opening first at the bottom. **C. màjus,** Linn., is a European plant, now run wild in waste places, and often seen in old gardens. It is biennial or perennial, with brittle, hairy stems and pinnately-parted lvs., the lobes rounded and toothed (or, in var. *laciniàtum* again dissected). The plant has yellow juice. Lvs. light-glaucous underneath.

CHELÒNE (Greek for *tortoise* or *turtle:* the corolla fancied to resemble a reptile's head). *Scrophulariàceæ.* TURTLE HEAD. Several North American perennial herbs, some of which are now sold by dealers in native plants. Allied to Pentstemon. Corolla more or less 2-lipped or gaping, white or red: anthers 4, woolly, and a rudiment of a fifth stamen: seeds winged: lvs. opposite, serrate: fls. large and showy. Half-shaded places are preferable for these easily cultivated plants. Very dry ground should be avoided, from the fact that they are best in swampy places. In the ordinary border they should have a very liberal mulch of old manure in their growing season: 4 to 5 in. thick is none too much; the surface roots will feed in this compost, and the plants are not so liable to suffer from drought when thus protected.

A. *Fls. in terminal and axillary close spikes.*

B. *Lvs. broad-ovate, long-petioled.*

Lỳoni, Pursh. Plant, about 2 ft. high: lvs. often cordate at base, thin, evenly serrate: fl.-bracts minutely ciliate; fls. rose-purple. Mts., N. Car. and S.

BB. *Lvs. lanceolate or oblong, short-petioled.*

obliqua, Linn. Two ft. or less: lvs. 2–5 in. long, broad-lanceolate or oblong, very veiny, sharp- or deep-serrate: fl.-bracts ciliate: fls. deep rose. Damp grounds, Ill. and Va., S.

glàbra, Linn. (*C. oblìqua*, var. *álba*, Hort.). One–2 or more ft. high: lvs. narrower, acuminate, appressed-serrate, nearly sessile, not very veiny: fl.-bracts not ciliate: fls. white or rose-tinged. Wet grounds: common.

AA. *Fls. in a loose thyrse or panicle.*

nemoròsa, Dough. Two ft. or less high, of unpleasant odor: lvs. ovate and acute, sharp-dentate, sessile or nearly so: fl.-bracts none; corolla 1 in. long, violet-purple. Calif. and N.

C. barbàta of gardens is Pentstemon barbatus.

J. B. KELLER and L. H. B.

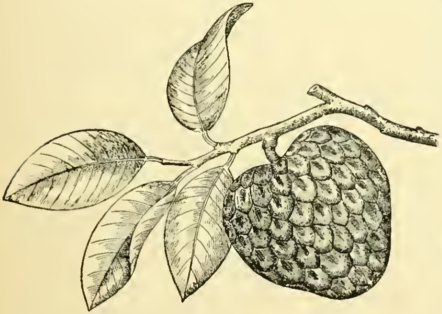
CHENILLE PLANT. A proposed name for *Acalypha hispida*, better known as *A. Sanderi.*

CHENOPÒDIUM (*goose-foot*, alluding to the shape of the lvs.). *Chenopodiàceæ.* Widely dispersed weedy herbs, with very inconspicuous greenish fls. in glomerules or spikes. Spinach, beet, and orach are allied plants. Fls. perfect; calyx 4–5-parted; petals wanting; stamens usually 5; styles 2 or 3. The calyx sometimes enlarges and becomes succulent and colored, enclosing the fr., and the glomerules may then look like berries, as in the common Strawberry Blite (*C. capitatum*, Wats., or *Blitum capitatum*, Linn.). This plant has been introduced to the trade as a pot-herb. It is an annual of easiest culture, with hastate-ovate toothed lvs. and fleshy red glomerules. The common pigweeds are Chenopodiums of several kinds, the commonest being *C. album*, Linn. This species and others are used as pot-herbs or greens in the country. The Good-King-Henry is *C. Bonus-Henricus*, Linn. It is a perennial, often cult. for its succulent spring shoots and lvs., which

Plate V. Cherries

Showing several commercial varieties of sweet and sour kinds

are used as greens. In American gardens it is usually known as Mercury (the name is sometimes corrupted to Markery). Lvs. triangular-ovate, with very long, wide-spreading basal lobes; margins entire; plant mealy. The plant is of the easiest culture; 1–2 ft. high. Other Chenopodiums of economic interest are the Quinoa (*C. Quinoa*, Willd.), of S. Amer., of which the large seeds are used as food (it is an annual, with aspect of the common pigweed, *C. album;* seeds sold by European dealers. B.M. 3641); *C. ambrosioides*, Linn., Mexican Tea, affords a medicinal extract; *C. anthelminticum*, Linn., Wormseed, affords a vermifuge. The Feather Geranium or Jerusalem Oak of florists is *C. Botrys*, Linn. It is annual, glandular-pubescent and aromatic, 1–3 ft. high, with pinnatifid lvs. and long, feather-like, enduring spikes, for which it is used in vases and baskets. Pretty. L. H. B.



425. Cherimoya.

CHERIMOYA, CHERIMOYER (*Anona Cherimolia*, Mill.). Fig. 425. The Cherimoya is considered by many to be the finest of the subtropical fruits, and that not only by the natives of the countries where it grows, but also by Europeans. It is somewhat like the Sweet Sop (*A. squamosa*); both are excellent when grown in climates that suit them; but the Cherimoya has a decided acidity, which is most agreeable and grateful to the taste. See *Anona*. The fruit is rounded, but irregular in shape, weighing from 3 to 5 lbs., and even double that under cultivation. There is a thin, greenish rind, marked off by somewhat raised lines into pentagonal or hexagonal spaces. Beneath is a white pulp, embedded in which are the black seeds, radiating from an internal central stalk. The white pulp is the edible portion; it is of the consistence of a corn-flour pudding. If picked when full-grown, they will ripen gradually, and can be kept 7 or 8 days before eating.

The tree is from 15 to 30 feet in height, with a broad spreading head and pendent branches. The leaves are oblong, with velvety down on the under surface. The flowers have 3 outer petals, which are oblong-linear in shape, and keeled on the inner side; the 3 inner petals are minute, alternate with the outer. It is found growing spontaneously at certain elevations in Central America, and western South America, as far south as Chile, but it is quite uncertain where it is truly wild in all this region. De Candolle, in his "Origin of Cultivated Plants," considers it most probable that it is indigenous in Equador, and perhaps in the neighboring part of Peru. It was introduced into Jamaica in 1786 by Mr. Hinton East, and is now of spontaneous growth in a limited area at a certain elevation on the southern slopes of the Blue mountains, corresponding fairly well with the district in which the far-famed Blue Mountain coffee is cultivated. The altitude at which it is found is between 2,500 and 5,000 feet. In Madeira, the Cherimoya has taken the place of the grape vine on many of the estates on the warm southern slopes of the island. The cultivation is systematic. The 2-year-old seedlings are grafted. The trees are pruned and trained, and manure is regularly supplied. The result of careful selection is that there are varieties with scarcely any seeds, and weighing 12 to 16 lbs. Ordinary fruits, weighing 3 to 8 lbs., are sold in the London market at $1.50; large ones are sold at $2.50, and even $3.

W. Fawcett.

CHERRY. Cultivated tree Cherries have probably sprung from two European species, *Prunus Avium*, Linn., and *Prunus Cerasus*, Linn. The domesticated forms of *Prunus Avium* are characterized by a tall, erect growth (Fig. 426); reddish brown, glossy bark, which separates in rings; flowers generally in clusters on lateral spurs, appearing with the limp, gradually taper-pointed leaves; fruit red, yellow, or black, generally sweet, spherical, heart-shaped, or pointed; flesh soft or firm. Sour Cherries are low-headed and spreading (Fig. 427); flowers in clusters from lateral buds, appearing before the hard, stiff, rather abruptly pointed, light or grayish green leaves. The following is the latest classification (Bailey, Bull. 98, Cornell Exp. Sta.):

426. Tall, erect growth of Sweet Cherry.

Prunus Avium has four representatives in the United States:

I. The Mazzards, or inferior seedlings; fruit of various shapes and colors; common along roadsides. In the middle Atlantic states, the wild Mazzard trees often attain great age and size, particularly in the Delaware-Chesapeake peninsula (Fig. 428).

II. The Hearts, or heart-shaped, soft, sweet Cherries, light or dark, represented by Black Tartarian and Governor Wood.

III. The Bigarreaus, or heart-shaped, firm-fleshed, sweet Cherries, like the Napoleon and Windsor.

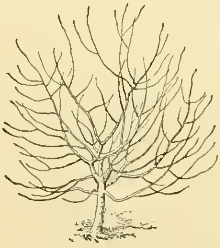
IV. The Dukes; light-colored, somewhat acid flesh, such as May Duke and Reine Hortense.

From *Prunus Cerasus* two classes have sprung:

I. The Amarelles, or light-colored sour Cherries, with colorless juice, represented by Early Richmond and Montmorency.

II. The Morellos, or dark-colored sour Cherries, with dark-colored juice, like the English Morello and Louis Philippe.

The following species also have horticultural value: *Prunus Mahaleb*, an Old World type, hardier and smaller, on which other Cherries are largely worked; *Prunus Pennsylvanica*, the native wild red, pin, or bird Cherry, whose hardiness may adapt it as a stock for the Plains states; *Prunus Besseyi* and *Prunus pumila*, the native sand or dwarf Cherries, the former represented by the Improved Dwarf Rocky Mountain Cherry. See *Prunus*.



427. Low-headed and spreading growth of Sour Cherry.

The Cherry is not cultivated as a leading industry east of the Rocky mountains, except in western New York, where the sour varieties are grown for canning. The sweet Cherry is confined mostly to door-yard and fence-corner plantings. Sour kinds are found in orchard blocks in New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Kansas and Nebraska. Sweet Cherry culture, however, is adapted to the states between the

39th and 44th degrees of latitude and the 68th and 86th degrees of longitude, and to contiguous areas having similar climatic conditions. Spontaneous forms of it attain great size on the Chesapeake peninsula (Fig. 428). The sour Cherry may be grown with profit between the 35th and 45th degrees of latitude and the 68th and 100th degrees of longitude.

The Mazzard is the best stock for both sweet and sour Cherries in the east. The Mahaleb is more widely used for the sour kinds, however, as it is easier to bud, and it is free from leaf blight in the nursery. The Mazzard forms a better root system, stronger union, a longer lived tree, and is sufficiently hardy. For the Plains states the hardier Mahaleb stocks should be used.

The Cherry likes an elevated, naturally light, dry, loamy, retentive soil. The sour kinds need more moisture, and will thrive in heavier land. A soil not naturally dry may be corrected by under-draining, and on light, dry knolls, the moisture capacity may be increased by green manures and surface tillage.

The sweet Cherries should be set 28 feet to 30 feet apart each way; the sour kinds, from 16 feet to 18 feet. The trees are generally set at two years from the bud.

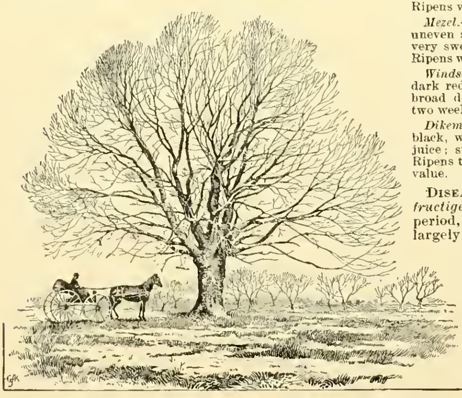
The sweet kinds are started with 3 to 5 main arms, with no central leader, about 3½ feet high, and the branches are pruned to side buds for a few years to induce a spreading, rather than a spire-like form. The top of a sour Cherry is made like that of a peach tree.

Plow the Cherry orchard lightly in the early spring, and cultivate it every ten days, or after every rain, till the middle of June or the first of July. Seed at the last cultivation with a winter cover-crop. Stimulate the trees with leguminous cover-crops when needed, but the sweet Cherry is a gross feeder and a rapid grower, and undue stimulation must be avoided. Keep the orchard in sod and pasture it with sheep, along the southern and western limits of profitable sweet Cherry culture, and withhold nitrogenous manures.

Nitrogen, potash, and phosphoric acid are the three essential fertilizers. Nitrogen may be supplied in leguminous crops; potash as muriate, at 150 lbs. to 300 lbs.; and phosphoric acid in dissolved rock, at 300 lbs. to 500 lbs per acre.

Cherries should be picked by the stems into small baskets a few days before ripe. Sort out all stemless, small and imperfect fruits. Face the perfect Cherries in small, attractive boxes or baskets, and pack these in small cases or crates. The choicer the fruit, the more strikingly it should be displayed. Guard against breaking the fruit spurs in picking the sweet Cherries. Fruit for canning is less laboriously packed, but may be as carefully picked.

The profits depend on the varieties and markets, but largely on the personality of the grower, and on his skill as a salesman. The range of profit for the sour Cherry is from $30 to $100 per acre, and from $50 to $300 or more for the sweet.



428. Old Sweet Cherry tree on the Chesapeake peninsula.

The varieties adapt themselves to a wide range of territory. An imperative need, however, is the development of varieties with striking features for local adaptation. In the prairie states and the extreme north, the hardier Amarelles and Morellos comprise the profitable kinds. Formally the dark-colored, more acid Morellos were most sought after; now the milder Amarelles are demanded by both canners and consumers. In the following lists, the varieties are named more for the purpose of illustrating the different types than for recommending specific varieties.

Amongst Amarelles, the Early Richmond and Montmorency are the leading types.

Early Richmond (Fig. 429).—Size medium; pit large; light red; poor quality; vigorous growth. Ripens June 20 in New York.

Montmorency.—Large, broad, flattened; pit medium; light red; flesh nearly colorless; juice moderately sour; vigorous growth; generally productive. Two weeks after Early Richmond. Most valuable Amarelle for the east.

Among the Morellos, Ostheim, Louis Philippe and English Morello are important types.

Ostheim (Fig. 430).—Dark red; roundish; flesh dark, tender; juice mild, dark; productive; hardy; growth slender. A week after Early Richmond, smaller. Too early for the east.

Louis Philippe.—Size of Montmorency, and ripens with it; round; acid; skin and flesh dark. Rather shy bearer in the east, but valuable in the west.

English Morello.—Two weeks later than Montmorency; more open, drooping habit: fruit medium, roundish; red-black; very sour, slightly astringent; flesh and juice dark, purplish crimson.

Among the sweet Cherries, the firm-fleshed red or black Bigarreaus are the most profitable. The light Bigarreaus and Hearts are more susceptible to the fruit-rot, and sell less readily. Representative types of Heart and light Bigarreau Cherries are the following:

Black Tartarian.—The most valuable Heart Cherry. Productive; vigorous, hardy, early; large; dark red or black; flesh dark purplish; very juicy, sweet.

Napoleon (Fig. 431).—One of the best light Bigarreaus. Fruit large; flesh hard, brittle, colorless; light lemon yellow, with reddish cheek; heavy bearer; rots if not picked before ripe; splits in wet weather. A week before Black Tartarian.

From the dark Bigarreaus the following are among the best types:

Robert's Red Heart.—Bright, dark red, with an under mottling; as large as Napoleon; flesh pinkish; juice nearly colorless, subacid; heavy, regular bearer in Hudson river valley. Ripens with Napoleon.

Mezel.—Large, heart-shaped obtuse, flattened at both sides; uneven skin, dark red to black; firm, but heart-like; juicy; very sweet; stem long and tortuous; heavy bearer locally. Ripens with Napoleon.

Windsor.—Large; roundish-oblong; firm; juicy; mottled dark red; flesh pinkish white; stem medium, set in slight, broad depression; heavy bearer, vigorous, upright. Ripens two weeks after Napoleon. Very profitable.

Dikeman.—Large, heart-shaped, obtuse, flattened on one side; black, with extremely firm, reddish flesh; subacid, reddish juice; stem medium, in a slight, broad depression; vigorous. Ripens three weeks or more after Windsor. A variety of great value.

DISEASES AND INSECTS.—The brown rot (*Monilia fructigena*), which attacks the fruit at the ripening period, and particularly during sultry weather, can be largely avoided by picking the fruit a few days before ripe. It may also fatally attack the flowers, leaves and twigs. In localities where the Cherry blooms, but does not fruit, the trees should be sprayed with Bordeaux mixture before the buds unfold, again when the fruit is set, and two or three times thereafter, with a colorless fungicide.

Black knot (*Plowrightia morbosa*, Sacc.). See under *Plum*.

Leaf blight (*Cylindrosporium Padi*, Karst). See under *Plum*.

Powdery mildew (*Podosphæra oxycanthæ*,

De Bray) is often severe in the sour Cherry, but can be checked by thorough applications of a fungicide.

429. Early Richmond Cherry (× ½).

The aphis (*Myzus cerasi*, Linn.) appears in the early part of the season on the young shoots, the leaves, the stems, and less frequently on the body of the fruit of the sweet Cherries. It excretes honey-dew abundantly. The leaves curl upward and inward. Spray with kerosene emulsion, 1 part to 6 of water; or with fish-oil soap, 1 pound to 6 gallons of water, before the leaves curl.

The curculio (*Conotrachelus nenuphar*). See same on *Plum*.

CLIMATIC INJURIES. — *Sun-scald and bursting of the bark.* —The sweet Cherry is liable to a fatal injury from sun-scald in the south and prairie states. The trouble occurs in the spring, when the rays of the sun cause alternate freezing and thawing of the growing tissues on the south and west sides. In these localities, the bark of the tree frequently bursts open, and large quantities of gum exude. A rich garden loam, a summer drought followed by fall rain, excessive wood stimulation, violent changes of temperature in the winter, or other factors unfavorable to the maturing of the wood, aggravate the difficulty. The bursting of the bark is probably caused by the freezing and thawing of the tissues under these unfavorable conditions. Both troubles are more injurious to trees with exposed trunks. A low-headed and spreading top, soils not too rich, and cultural methods which favor the early maturity of the wood, lessen the danger. The trunks may also be protected by a board, matting, or screen of some kind on the sunny side during the spring months. G. HAROLD POWELL.

THE CHERRY IN CALIFORNIA.—In commercial importance, the Cherry is least of the fruits of the temperate zone grown in California on a commercial scale. This is not because the finest Cherries cannot be grown, but because the avenues for the disposition of the product are not as wide as for other leading fruits. Recently there are indications that these avenues will be widened, for last year (1898) about 300 car loads were profitably shipped in a fresh state to eastern markets, and a product of 150,000 cases of canned Cherries was disposed of to advantage; but until it is demonstrated that such distant demands will increase, present plantations will not be largely extended. Cherries are costly in picking and packing, and to incur the chances of a local market, over supplied when ever the trees do their full duty, the grower does not enjoy. Cherry drying has never seemed warranted on a large scale, because of the large amount of labor required to the pound of product; and the grower has had no recourse when the canner and local consumer would only pay the cost of picking and boxing. A good shipping demand seems, therefore, the measure of the extension of California's Cherry interest, and the early ripening of the fruit, which permits its sale during the blooming season of eastern Cherry trees, is the leading surety of such demand. On several occasions early varieties have been shipped from the Vacaville district overland, on March 31, but the usual opening date is about two weeks later, and thence onward later varieties, and from later regions, may be shipped until July, if found profitable.

430. Ostheim Cherry (× ½).

But, though there is plenty of good land upon which to multiply the present total of half a million trees, the Cherry regions of California are restricted. It is one of the most exacting of all trees, and is only profitable when its requirements are respected. About one-half of the present acreage lies in valleys opening upon the bay of San Francisco, where deep and moist, but well drained alluvial soil fosters strong and sound root-growth, and modified atmospheric aridity favors leaf and fruiting. On similar deep and moist soils, however, the tree enters the hot interior valleys to certain limits, chiefly along the river bottoms. It abhors dry plains. In dry air it usually refuses to fruit, although if the soil be moist, it may make stalwart tree growth. In foot-hill valleys it sometimes does admirably, both in growth and fruiting, and in mountain valleys, above an elevation of 2,000 feet, on good soil, and in the greater rainfall, and even with the snow flurries, which are experienced every year at proper elevations, the tree becomes very thrifty and profitable to the limits of local markets. The tree seems to have no geographical limitations in California; wherever suitable soil and weather conditions occur, it accepts the situation—the Dukes and Morellos succeeding under conditions too trying for the Hearts and Bigarreans, but the latter comprise all the varieties that are of commercial account.

431. Napoleon Cherry (× ⅓).

Cherry trees are grown by budding upon Mazzard and Mahaleb seedlings—the latter chiefly imported. It is customary to plant out in orchards at the end of the first year's growth from the bud, though 2-year-old Cherry trees can be more successfully handled than other 2-year-olds. The trees are headed at 1 to 2 feet from the ground, cut back to promote low branching for two years, and then allowed to make long branches, and not usually shortened-in, so long as thrifty and healthy. The tree, in a good environment, is, however, a very hardy tree, and will endure pruning to almost any degree. We have many trees which have made a very broad but not usually high growth, bearing 1,000 lbs. of fruit to the tree, and a few others which have even doubled that figure, while others have been dwarfed and trained *en espalier*. The commercial orchards are, however, uniformly of low trees, approximately of vase form in exterior outline, and with branches curving outward without shortening.

The Cherry is very readily grafted over by the usual top-grafting methods, and large orchards have been thus transformed into varieties more acceptable for canning or shipping. Comparatively few varieties are grown. Early Purple Guigne, Guigne Marbre, and Knight's Early Black are grown in early ripening localities. Black Tartarian and Lewelling are the main stay for black Cherries. The Napoleon Bigarreau (locally known as Royal Ann) is the ideal for a white Cherry, and almost excludes all others, though the Rockport Bigarreau has some standing. Of all the varieties grown, the Black Tartarian and Napoleon Bigarreau, constitute 70 per cent of the crop, and probably 90 per cent of the amount marketed.

California-grown Cherries attain large size; the canner's requirement for fancy fruit is a diameter not less than ⅞ of an inch, and for No. 1, not less than ¾ of an inch. Wholesale prices usually range from $40 to $60 per ton for black and $80 to $120 for white, but this year (1899) canners have paid as high as $160 per ton for white Cherries. The higher rates can only be expected during years of short crops.

Edward J. Wickson.

CHERVIL. A term applied to two umbelliferous plants which produce edible parts, neither of which is well known in America. The name is sometimes applied, also, to the sweet cicely.

Salad Chervil or Leaf Chervil is *Scandix cerefolium*, Linn., a native of S. Eu. It is annual. The neat and aromatic lvs. are used like parsley, which they much resemble. The lvs. are decompound, with oval cut leaflets; and there are varieties with much cut and curled foliage. The cultivation of Salad Chervil presents no difficulties. Leaves are ready to use in 6 to 10 weeks from seed sowing, and any good garden soil is congenial. It thrives best in the cooler and moister part of the year.

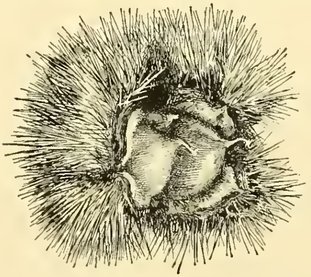
Tuberous or Turnip-rooted Chervil is *Chærophyllum bulbosum*, Linn., of S. Eu. It is biennial or plur-annual, like the radish and carrot. The roots are like small carrots in shape (4–5 in. long), but are gray or blackish, and the flesh is of different flavor. The roots are eaten as carrots are, either boiled or in stews. The one difficulty in the growing of Tuberous Chervil is the fact that the seeds germinate very tardily, or even not at all, if kept dry over winter. It is customary, therefore, to sow them in the fall, although they do not germinate until spring. If they are to be reserved for spring growing, they should be stratified (see *Seedage*) or kept in sand. In four or five months after germination, the roots are fit to use, although they improve in quality by being left in the ground.

L. H. B.

CHESS, or CHEAT. *Bromus.*

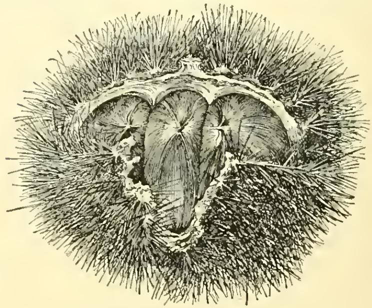
CHESTNUT. Three species of tree or true Chestnuts are cultivated in this country for fruit,—the European *Castanea sativa*, the American *Castanea Americana*, the Japanese *Castanea crenata*. (See *Castanea*). The horticultural characters which distinguish these three types are as follows:

European Chestnuts.—Tree large, with a spreading but compact head, stocky, smooth-barked twigs and large glossy buds of a yellowish brown color; leaves oblong-lanceolate, abrubtly pointed, with coarse sometimes incurved serrations, thick and leathery, generally pubescent beneath when young, but green on both sides when mature. Burs very large, with long, branching spines, and a thick, velvety lining. Nut larger than American Chestnut, sometimes very large, shell dark mahogany brown, pubescent at tip, thick, tough and leathery; kernel enclosed in a thin, tough and astringent skin: quality variable from insipid, astringent to moderately sweet. The leaves remain on the trees until late in autumn, but are more susceptible to the attacks of fungi than the American and Japanese species. At least one variegated and one cut-leaved variety are grown as ornamentals. This species is variously known as European, French, Spanish and Italian Chestnut (*Castanea sativa*), and Sweet Chestnut of English writers. It is an inhabitant of mountain forests in the temperate regions of western Asia, Europe and north Africa. Esteemed for its nuts in Spain, France and Italy, where they have constituted an important article of food since an early day. Introduced to the United States by Irénée Dupont, at Wilmington, Del., in 1803, though recorded by Jefferson, under the designation "French Chestnut," as grafted by him on native Chestnut near Charlottesville (Monticello), Va., in 1773.



432. Native wild Chestnuts. Nearly natural size.

American Chestnut (*C. Americana*).—Fig. 432. A tall, straight, columnar tree, in forests reaching a height of 100 ft. and a diameter of 3 to 4 ft.; when grown in the open, forming a low, round-topped head of slightly pendulous branches. Leaves thinner than in *Castanea sativa*, oblong-lanceolate, acute, long pointed at the apex, coarsely serrate except toward the wedge-shaped base, green and glabrous on both surfaces, changing to bright, clear yellow late in autumn. The staminate flowers open in June or July, after leaves have attained full size, and exhale a sweet, heavy odor, disagreeable to many persons, and sometimes causing symptoms of hay fever. The 2- or 3-flowered involucres of pistillate flowers are on short, stout peduncles at the bases of androgynous aments which bear toward their tips scattered clusters of staminate flowers. Burs smaller and spines sharper than in *C. sativa*. The nuts, usually 2 or 3, rarely 5 to 7, are usually broader than long, and much compressed by crowding, though sometimes nearly oblong and approaching cylindrical. They are of a bright brown color, covered at the apex with thick, pale tomentum, which sometimes extends nearly to the base of the nut. The nuts are sweet and agreeable in flavor, the best among Chestnuts, and are marketed in large quantities from the forests of the Appalachian region, eastern North America, Me. to Ga., westward to Michigan, Mississippi and Louisiana. Gradually receding from its southern areas from causes not yet understood. A few selected forms have been propagated by grafting.



433. Japanese Chestnuts (× ½).

Japanese Chestnut (*C. crenata*).—Fig. 433. A dwarfish, close-headed tree of slender growth, said to attain a height of 50 ft. in Japan, with small buds; leaves smaller than other Chestnuts, lanceolate-oblong, usually pointed, with a truncate or cordate base, finely serrated, with shallow, sharp-pointed indentations, whitish tomentose beneath, pale green above, less subject to injury by fungi than other species. Burs small, with a thin, papery lining and short, widely branching spines. Nuts large to very large, glossy, usually 3, sometimes 5 or 7 in a bur, usually inferior to the other Chestnuts in quality, though good when cooked, and in a few varieties excellent in the fresh state. Many cultural varieties are recognized. Introduced to the United States in 1876 by S. B. Parsings, Flushing, N. Y.

Aside from these three types, there are certain dwarf and small-fruited Castaneas known as Chinquapins. The two native Chinquapins may be contrasted as follows:

Common or Tree Chinquapin (*Castanea pumila*).—Fig. 434. A shrub 4 or 5 feet tall, rarely a tree, attaining a height of 50 feet, with slender branchlets marked with numerous minute lenticels, and coated with a pale tomentum, which disappears during the first winter. Leaves oblong, acute and coarsely serrate at apex, bright yellowish green, changing to dull yellow before falling in autumn. Flowers strong-smelling, the catkins of staminate ones appearing with the unfolding leaves in May or June, the spicate, androgynous aments later, with pistillate flowers in spiny involucres, producing solitary, cylindrical nuts ¾ to 1 inch in length and ⅓ inch in diameter, with sweet seeds. This species occurs in dry lands from southern Pennsylvania to Florida and Texas, and its nuts, which ripen earlier than the American Chestnut, are esteemed for food and marketed in considerable quantities. Apparent intermediates between this species and the American Chestnut, probably of hybrid origin, are reported from several localities in Virginia and Tennessee. This species attains truly arborescent proportions in southern Arkansas and eastern Texas. The shrub form is sparingly introduced to cultivation, and is being somewhat used in its native regions as a stock on which to graft improved Chestnuts. It promises to become useful for this purpose, but has the troublesome habit of throwing up numerous suckers or stolons. One named variety, the Fuller, has been published. Fig. 434 is adapted from the Nut Culture bulletin of the U. S. Dept. of Agric.

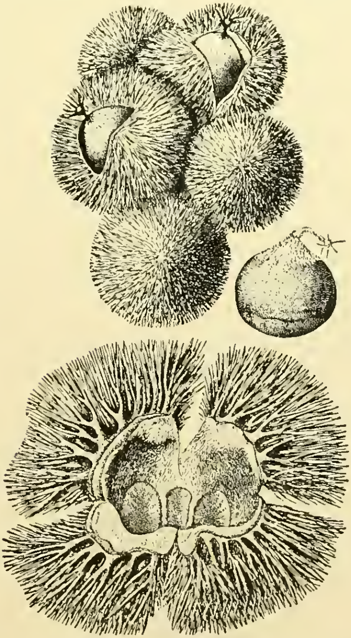
Bush Chinquapin (*Castanea alnifolia*).—A shrub, rarely more than 3 ft. in height, forming small thickets, by means of stolons, in sandy barrens, South Atlantic states, westward to Lousiana and Arkansas. Distinguished from *C. pumila* by larger, oval-lanceolate, mostly obtuse leaves, which are but slightly tomentose beneath, and by its larger nuts, which ripen earlier.

The cultural range of Castanea in America is not well defined, but extends from Florida and Texas to Massachusetts and Wisconsin, and on the Pacific slope. The 3 species cultivated in America thrive best on dry, rocky or gravelly ridges or silicious uplands, failing on heavy clays and on limestone soils unless deep, dry and rich.

Propagation of species is by seeds. Certain types reproduce their striking characteristics in their seedlings, but varieties are perpetuated by grafting; occasionally by budding. Seeds for planting should be free from insect larvæ, and should not be allowed to dry out before planting. They may be planted in drills in fall on deep and well-drained loam, or, to avoid damage by rodents, may be stratified in damp sand until spring. Nuts held in cold storage at 15° F. from October to April have germinated well at Washington, D. C. Young trees destined for removal to orchard should be transplanted in nursery at one year old, to promote symmetrical development of root system. Grafting may be done on any of the species of Castanea, and on some of the oaks, notably the Chestnut Oak, *Quercus Prinus*, though the durablity of grafts on the oak is questionable. Where the Chestnut is indigenous, bearing orchards of improved varieties are quickly secured by cutting down and removing the timber and grafting the young sprouts which spring up in abundance about the Chestnut stumps (Fig. 435). Recently the Chinquapin has been similarly used with good success where Chestnut does not occur. Grafting may be by splice method on 1-year-old seedling roots; by splice or cleft at crown on 2- or 3-year trees in place; or by veneer, splice or cleft methods on 1- to 3-year-old sprouts or branches. Top-working of old trees is uncertain and only practiced in special cases. Cions should be dormant, and work may be done at any time after freezing ceases, but in trunk and branch grafting best results are obtained by most grafters if work is done after leaves begin to unfold. Two- or 3-bud cions are preferred. The fitting of cion to cleft or splice and the waxing should be carefully done. If strips of waxed muslin are wrapped about the stubs the danger of loss by summer cracking of wax is lessened. In cleft-grafting young sprouts or seedlings, the stub should be cut 2 or 3 inches above the departure of a branch, to prevent too deep splitting of cleft. Two or three weeks after growth begins the waxing should be inspected and repaired if cracked. If grafts make rank and brittle growth they should be checked by pinching, and if in exposed situations, tied to stakes to prevent breaking out of cions. Budding is sometimes practiced, usually by use of dormant buds inserted in shoots of previous year, when the bark "slips" after growth has begun in spring.

The Chestnut is admirably adapted to ornamental planting, either singly or in groups on suitable soils. The native species is successfully used as a roadside tree in many sections outside of its natural range. It requires a space of at least 40 feet for development when thus used; the European species 30 feet and the Japanese 20 feet. If in orchard, the last mentioned may be planted as close as 20 feet, and thinned when the trees begin to crowd, thus securing several crops of nuts from land otherwise unoccupied.

Care of Orchards.—Planted orchards are yet few in America, most of the extensive commercial efforts having consisted in the grafting of sprouts on rough lands where the American Chestnut is indigenous. On such lands no cultivation is attempted, the brambles and undesired sprouts being held in check by occasional cutting in summer, or by pasturing with sheep. Much care is necessary to protect against damage of the sprouts by fire on such land. Clean cultivation, at least during the first few years, is probably best in planted orchards, though heavy mulching may be found a satisfactory substitute. The Japanese and some of the American varieties of the European species require thinning of the burs on young trees to avoid over-bearing, with its consequent injury to the vitality of the tree.



434. Chinquapin. Nut and bur natural size.

Leaf diseases are apparently subject to control by Bordeaux mixture, but for the weevils, which damage the nuts previous to maturity, no satisfactory remedy has yet been discovered.

The varieties of the three species, though possessing many points in common, differ sufficiently in important characteristics to justify separate grouping for cultural discussion. As Chestnut culture is new in this country, it seems best to append descriptions of all the varieties which are in the American trade. For fuller discussion of cultivated Chestnuts, see Nut Culture in the United States (Bull. Div. of Pomology, U. S. Dept. of Agric.), from which Fig. 434 is adapted; Nut Culturist, A. S. Fuller, 1896; European and Japanese Chestnuts in Eastern U. S., G. Harold Powell (Bull. Del. Exp. Station), 1898; Nut Culture for Profit, Jno. R. Parry, 1897.

435. Chestnut sprouts two years grafted.
The cion was inserted where branching begins.

American Group.—Though the wild nuts exhibit wide variations in size, form, quality, productiveness, and season of ripening, but few varieties have been dignified by names and propagated. Solitary trees are frequently sterile, though producing both staminate and pistillate flowers, apparently requiring cross-fertilization to insure fruitfulness. This is especially true of planted trees of this species on the Pacific slope, where productive trees are reported to be rare. The susceptibility of the species to injury by leaf diseases, as pointed out by Powell, and the injury to nuts by larvæ of weevils, are drawbacks to its extensive culture.

The following varieties are propagated to some extent:

Dulaney.—Bowling Green, Ky. Large, and of fine quality. Original tree productive, though isolated.

Griffin.—Griffin, Ga. A large, very downy nut, of good quality.

Hathaway.—Little Prairie Ronde, Mich. A large, light colored, sweet nut, annually productive, frequently having 5 to 7 nuts to the bur.

Ketcham.—Mountainville, N. Y. Above medium in size, oblong, tomentose, sweet. Tree productive and vigorous in heavy sod at 50 years of age.

Murrell.—Coleman's Falls, Va. A large, high flavored nut, bearing 3 nuts to the bur.

Otto.—Otto, Tenn. Large, oblong, very downy at tip, very sweet, and rich.

Watson.—Fay, Pa. Medium to large, slightly downy, compressed, very good.

European Group.—It is a significant fact that, during the century that has elapsed since the introduction of this species, the imported named varieties of Europe have not found favor in eastern America. Seedling trees have been found productive and profitable at many points in New Jersey, Pennsylvania, Delaware, and Maryland, however, and these form the basis of the culture of the species east of the continental divide. West of the Rocky mountains, several of the choice French "Marrons" are reported to succeed in California and Oregon. Among the more important varieties of the European group in America, are the following:

Anderson.—Flushing, N. J. Bur medium to small; nuts of medium size, bright reddish brown, pubescent at the tip and over half of the nut. Tree a strong grower, with medium to small leathery leaves. Very productive.

Bartram.—Milltown, Pa. Bur medium to small; nut medium, thickly pubescent at tip, dark, reddish mahogany color; 3 in a bur; unusually free from insect attack; quality good. Tree vigorous, spreading, with large leaves; productive.

Chalon (syn., Marron Chalon Early).—France. Sparingly grown in California. Nut of medium size, early, productive, precocious.

Combale (Marron Combale).—France. A large and handsome, bright brown striped nut, with but little tomentum at tip; usually 2, sometimes but 1, in a bur. Somewhat grown in California, where it was introduced from France about 1870.

Corson.—Plymouth Meeting, Pa. Bur large, with thin husk; nuts large, usually 3 in a bur; dark brown, ridged, heavily pubescent at tip; quality very good. Tree vigorous, spreading, very productive.

Dager.—Camden, Delaware. Bur medium; nut medium to large, dark brown, thickly tomentose, usually 3 in a bur; quality good. Tree vigorous, spreading, productive; a seedling of Ridgely.

Darlington.—Wilmington, Del. Bur medium to small: nut medium to large, usually 3 in a bur; dark distinctly striped, thickly tomentose at tip; sweet, good. Tree vigorous. One of the earliest to ripen of this group.

Lyon (Marron de Lyon).—France. A large, round nut of fair quality, grown in a small way in California, but less productive than Combale, which it resembles.

Marron.—This term is used by the French to designate the larger cultivated Chestnuts, most of which have relatively few nuts, often only 1 in a bur.

Moncur.—Dover, Del. A seedling of Ridgely. Bur medium; nuts medium, of light color, heavily tomentose; tree vigorous, spreading, very productive.

Nouzillard.—France. A large, handsome variety from central France, and there considered very productive and valuable. Has been tested in New Jersey, Pennsylvania and California, without marked success in any locality.

Numbo.—Morrisville, Pa. (Fig. 11, Pl. 14.) Bur medium, conical; nut large, from 2 to 3 in a bur: bright brown, striped, thinly tomentose, of good quality. Tree compact and drooping; rather uncertain in bearing.

Paragon (syn., Great American).—Germantown, Philadelphia, Pa. Bur very large; nut large, usually 3 in a bur, broad, plump, thickly tomentose at the tip, and thinly over two-thirds of surface, color dull brown, quality very good. Tree hardy, spreading, vigorous, with narrow, coarsely serrate leaves having a narrow base; subject to leaf blight, but very productive. The most widely planted and most uniformly successful variety of Chestnut yet cultivated in the United States. Possibly a hybrid with C. dentata. Fig. (photo) 4-yr. grafted tree in fruit. Mich.

Quercy (syn., Marron Quercy).—France. A beautiful, medium sized nut, commended in portions of California for precocity, earliness, productiveness and quality.

Ridgely (syn., Du Pont).—Wilmington, Del. Bur medium; nut medium to large, moderately tomentose, dark, of very good quality; tree vigorous, with narrow leaves free from blight; spreading, very productive, hardy. (Fig. 12, Pl. 14.)

Scott.—Burlington, N. J. Bur medium; nut medium, slightly pointed, usually 3 in a bur; glossy, dark brown, slightly tomentose at the tip. Tree open, spreading, very productive; said to be comparatively free from attacks of weevil.

Styer.—Concordville, Pa. Bur medium; nut medium pointed, dark brown, striped, tomentose at tip, 1 to 3 in a bur. Tree very vigorous, upright, with large, dark green leaves free from disease.

Japanese Group.—Though most of the imported Japanese Chestnuts have been found of poor quality for eating in the fresh state, the product of many imported seedling trees, and of a number of American-grown seedlings of this type, is equal to the European nut in flavor. The Japanese varieties in general have the advantage, also, of greater precocity and productiveness, larger size and earlier maturity of nut, greater freedom from injury by leaf diseases and nut-eating insect larvæ. As productiveness and earliness are the most important points in Chestnut culture at the present time, this type is the most important to commercial nut growers. The most important named varieties are as follows:

Alpha.—New Jersey. Bur medium; nuts medium to large, generally 3 in a bur, dark, of fair quality, ripening very early. Tree upright, very vigorous and productive.

Beta.—New Jersey. Bur small; nut medium, light brown, smooth, slightly tomentose at tip: good; ripening just after Alpha.

Biddle.—New Jersey. First fruited in Maryland. Bur medium; nut large, bright brown, broad, rather thickly tomentose, 2 to 5 in a bur; of medium season and fair quality. Tree regular, round-headed, vigorous.

Black (syn., Dr. Black).—New Jersey. First fruited in Maryland. Bur large; nut medium to large; 3 to 7 in a bur, consequently irregular in shape; dark brown, slightly tomentose, very early and of good quality. Tree round, close-headed, vigorous, productive.

Coe.—California. A large, very sweet variety, but recently disseminated. Tree upright, somewhat spreading.

Felton.—New Jersey. First fruited in Delaware. Bur small; nut medium, dark brown, slightly tomentose, rather early and of excellent quality. Tree round-headed and fairly productive.

Giant.—Japan. A trade name, under which a number of varieties have been imported from Japan. See Parry.

Hale (syn., Eighteen Months).—California. A newly introduced variety, having a large, dark brown nut of excellent quality. Very precocious.

Kent (syn., Extra Early).—New Jersey. First fruited in Delaware. Bur small; nut medium to large, dark, usually 3 in a bur; very early, of good quality. Tree round-headed, precocious, productive.

Kerr.—New Jersey. First fruited in Maryland. Bur small; nut medium to large, dark brown, broad, 3 in a bur, early, and of excellent quality. Tree vigorous, symmetrical, round-headed, very productive.

Killen.—New Jersey. First fruited in Delaware. Bur very large; nut very large, broad, light brown, slightly ridged, of excellent quality, midseason. Tree upright, open, spreading, moderately vigorous, productive. The largest Chestnut yet brought to notice.

Mammoth.—A trade name for the imported Japanese nuts and trees, not restricted to any particular variety.

Martin (syn., Col. Martin).—New Jersey. First fruited in Maryland. Bur large; nut large to very large, broad, bright reddish brown, slightly tomentose, 3 to 5 nuts in a bur. Midseason; of good quality for cooking. Tree vigorous, open, spreading, productive.

McFarland.—California. Bur very large; nut large, and of fine quality; early. Tree spreading, very productive. A newly disseminated variety of great promise.

Parry.—Japan. Bur very large; nut very large, 1 to 3 in a bur, broad, with apex sometimes depressed; dark brown, ridged, of fair quality. Tree moderately vigorous, open, spreading, with large leaves. One of the largest and most beautiful of this group. Selected for propagation as the best of 1,000 imported grafted Japanese Chestnuts. (Fig. 13, Pl. 14.)

Prolific.—Japan. Bur small; nut medium, rather long, striped, 3 in a bur; early. Tree vigorous, compact, with small narrow leaves.

Reliance.—New Jersey. Bur medium; nut medium to large, rather long, light brown, ridged; midseason, and of fair quality. Tree dwarfish, spreading, drooping, very precocious and productive; inclined to overbear, and needs thinning. Seedling of Parry.

Success.—New Jersey. Bur very large; nut very large, usually 3 in a bur; midseason; of rather poor quality until cooked. Seedling of Parry. Tree upright, productive.

Superb (syn., Parry's Superb).—New Jersey. Bur large; nut large, broad, brown, usually 3 in a bur, early, and of fair quality. Tree vigorous and very productive.

W. A. Taylor.

CHEVALIÈRA, CHEVALIÈRIA, CHEVALLIÈRA, CHEVALLIÈRIA. The species in the American trade are Æchmeas.

CHICK-PEA. See *Cicer*.

CHICKWEED. See *Cerastium* and *Stellaria*.

CHICORY, or SUCCORY (*Cichorium Intybus*, Linn.). *Compósitæ*. Fig. 436. A native of Europe, naturalized in America and familiar to many as a weed, is a pot-herb, a salad, and the leading adulterant of coffee. It has come prominently before the public since 1897 as an American farm crop. Prior to that year, its cultivation as an adulterant and substitute for coffee was largely prevented by the prejudice of the principal consumers, our foreign-born population, who insisted that American was inferior to European root, and also by the low tariff, which allowed the root to enter duty free, or with a very small impost. During 1898 and 1899 advantage has been taken of a protective duty, and several factories have been erected, for which farmers have shown a willingness to grow the roots. It is probable that within the next few years our home market will be fully supplied from American fields, in which development reliance is placed in the substitution of horse-power for manual labor, improved plows and cultivating implements for crude ones, machine-digging of the roots for hand-digging, efficient slicing machines, and improved evaporating kilns.

436. Flowers of Chicory (× ½).

Chicory will probably succeed wherever the sugar beet is grown in this country, the climatic requirements being similar. In general, it may be said to thrive upon all stone-free soils that will produce paying staple crops, except clays, lightest sands and mucks. The first are too hard, the second too dry, the third too rich in nitrogen and too sour. The surface layer of soil should be deep, the subsoil open and well drained. If the water supply be sufficient, high land is as good as low land of the same texture, though if too dry for profitable grain growing, the former may yet be made to produce paying crops of Chicory; but if too wet for cereals, the latter will generally be found unsuitable for this root. The fertilizing of the land should be the same as for other root crops, nitrogen being used sparingly, potash and phosphoric acid rather freely—$1\frac{1}{4}$ to $1\frac{1}{2}$ times as much of the former and $2\frac{1}{2}$ times the latter as has been removed by the preceding crop. It is best to apply these fertilizers to preceding crops that do not make heavy demands upon them. In rotation, Chicory is classed with root crops, and should be preceded by a small grain, since this is harvested in time for fall plowing. Clover should not immediately precede, since it leaves too much nitrogen in the soil. The ground being warm, fairly moist, thoroughly prepared by deep plowing, harrowing and scarifying with a weeder, the seed, which must be fresh and clean, is sown rather thickly but covered thinly, in drills 18 inches apart.

There are but few well-defined varieties of this plant used for field culture, and even the garden sorts are not as stable as could be desired. Of the former group, Magdeburg, Brunswick and Schlesische are the principal; of the latter, Witloof (so-called), Red Italian, Broad-leaved, Improved Variegated and Curled-leaved are best known. Witloof and Barbe de Capucin can be produced from any variety, the difference being brought about by the method of growing.

Chicory has no specific enemies in this country, and is troubled by only a few of the general-feeding insects, such as cut-worms and wire-worms.

From 6 to 10 tons is the general crop per acre, though with good management, 15 tons may be produced. The cost of growing and the returns are about as follows: Rent, wear of tools, etc., $5; preparation of land, $4.50; seed, 75 cents; cultivating and tending, $15; harvesting and delivering, $12; total, $37.25. Average price per ton, $7.

From a purely horticultural standpoint, Chicory is of interest as a root, a pot-herb, and a salad plant. The young, tender roots are occasionally boiled and served with butter, pepper and salt, like young carrots, but they have never become widely popular in this form. As a pot-herb, the young leaves are equal to those of dandelion. They are cut when 6 or 8 inches long, boiled in two waters to remove the bitter flavor, and served like spinach. As a salad, Chicory is famous in three forms: Common Blanched, Barbe de Capucin and Witloof. Barbe de Capucin is comprised of small, blanched leaves. Witloof is a more solid head. The pink, red and curled varieties make a very pretty appearance, and if well grown and served fresh are delicious, there being only a slightly bitter flavor. The method of growing is the same as for endive.

For Barbe and Witloof, well grown roots are dug in October, trimmed of unnecessary roots and of all but an inch of top. For Barbe, the roots are laid horizontally in tiers in moist earth, the whole forming a sloping heap, the crowns of the roots protruding an inch or so. Since darkness is essential, a warm vegetable cellar is the usual place selected to grow this vegetable, which requires 3 or 4 weeks to produce its fine white leaves. These are cut when about 6 inches long, eaten as a salad, boiled like kale or cut up like slaw. If undisturbed, the roots will continue to produce for some time. The most rapid way to produce Witloof is to plunge the roots (shortened to 5 inches) in spent tan bark, or such material, and cover with 2 feet or more of manure, the space under a greenhouse bench being used. In about 2 weeks, heads resembling cos lettuce may be dug up, boiled like Brussels sprouts, or served as salad. If the roots be left in place, protected from the light, but uncovered, a crop of leaves resembling Barbe may be gathered. Sowing and other cultural management is the same as for other garden roots, as beets and carrots. It is a pity that these vegetables are so little known in this country.

Chicory has run wild along roadsides and in dry fields in many parts of the country, and is considered to be a bad weed. However, the handsome sky-blue flowers (Fig. 436), which open only in sunshine, are very attractive. M. G. Kains.

CHÌLDSIA WÉRCKLEI. See *Hidalgoa*.

CHILIÁNTHUS (*a thousand flowers*). *Loganiàceæ*. Four or 5 South African trees or shrubs, very closely allied to Buddleia, from which it differs in having stamens exserted from the short tube: lvs. opposite, entire or dentate: fls. very numerous, in dense, terminal cymes or panicles. Unknown to the Amer. trade. The plants known as *Buddleia salicifolia*, Jacq., and *B. saligna*, Willd., are *Chilianthus arboreus*, Benth. (which is probably identical with *C. oleaceus*, Burch.).

CHILÓPSIS (Greek, *lip-like*). *Bignoniàceæ*. One shrub or low tree, **C. saligna**, Don (known also as *C. lineàris*, DC.), growing in dry districts from S. Texas to Calif., and in Mex. From its narrow-lanceolate or linear lvs., it is known as Desert Willow; also called Flowering Willow and Mimbres. It is a continuous-blooming plant, valuable for our extreme southern districts. It grows from 10 to 20 ft., bearing slender branches, opposite or verticillate lower lvs., and handsome, Bignonia-like fls. in a short, terminal raceme. The corolla is 1–2 in. long, 5-lobed and crimped, the tube and throat lilac, and two yellow stripes inside. Anthers 4; rudiment of a fifth stamen. L. H. B.

CHIMÁPHILA (Greek, *winter* and *friend;* green in winter). *Ericàceæ*. Pipsissewa. Half shrubby or herbaceous, with creeping stem: lvs. evergreen, serrate, in irregular whorls: fls. nodding, forming a terminal, few-fld. umbel, on a long, naked peduncle; petals 5, spreading; stamens 10: fr. a dehiscent, 5-celled capsule. Four species in N. America, Europe, and N. Asia to Japan; formerly united with Pyrola. Low, evergreen plants, with pretty white or reddish fls. in summer. They grow best in a light, sandy soil, mixed with peat or leaf-mold, and prefer a half-shady position. Prop. by division of the creeping rootstock. Useful in wild borders.

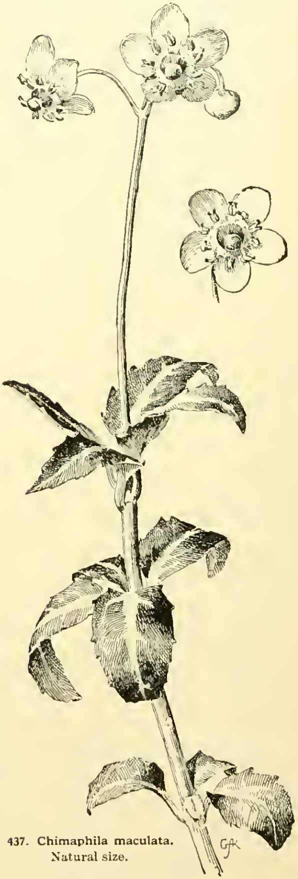
umbellàta, Nutt. (*C. corymbòsa*, Pursh). Five–8 in.: lvs. 3–6 in a whorl, short-petioled, cuneate-lanceolate, sharply serrate, dark green and shining above, 1–2 in. long: fls. 4–7, white or reddish, ½–¾in. wide. N. Amer., from Canada to Mexico, Europe, Japan. B.M.778. L.B.C. 5:463. Mn. 7:161.

maculàta, Pursh. Fig. 437. Lower and less branched than the foregoing: lvs. usually in 3's, ovate or oblong-lanceolate, sparsely and sharply serrate, variegated with white along the nerves, 1–2 in. long: fls. 2–5, white, ¾in. wide. From Canada to Georgia and Mississippi. B.M. 897. Mn. 9:1. Alfred Rehder.

CHIMONÁNTHUS is *Calycanthus*.

CHINESE LANTERN PLANT. See *Physalis*.

CHINESE SACRED LILY. Consult *Narcissus*.



437. Chimaphila maculata. Natural size.

CHIOCÓCCA. *Rubiàceæ*. Snowberry (which the name means in Greek). Shrubs, mostly climbing, of tropical Amer., and one in extreme S. Fla. Fls. in axillary panicles, the corolla funnel-form and 5-parted; stamens 5, inserted on the base of the corolla, the filaments cohering at base; style filiform, the stigma club-shaped: ovary 2–3-loculed, becoming a small, globular drupe. **C. racemòsa**, Linn., of the Florida Keys and S., is sometimes cult. in hothouses for its panicles of yellowish white fls. and the white frs. Lvs. ovate to lanceolate, thick and shining, entire: drupes ¼in. in diam. Twining; glabrous.

L. H. B.

CHIÓGENES (Greek, *snow, offspring;* referring to the snow-white berries). *Ericàceæ.* Trailing evergreen, with small alternate lvs. and inconspicuous axillary fls.; corolla 4-cleft; stamens 8, included: berry white, hirsute. Two species in the colder regions of N. Amer. and Japan. Slender trailing evergreens, in appearance much like the cranberry, rarely cultivated. Thriving best in moist and peaty soil, in a shaded position, creeping amongst growing moss. Prop. by seeds, by division or by cuttings in August under glass. The American species, **C. hispidula**, Torr. & Gray (*C. serpyllifòlia*, Salisb.), has hirsute branches and ovate, ¼–⅓in.-long ciliate lvs. and greenish white fls.

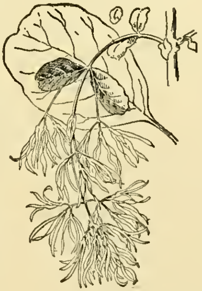
ALFRED REHDER.

CHIONÁNTHUS (Greek for *snow* and *flower;* alluding to the abundance of snow-white fls.). *Oleàceæ.* FRINGE TREE. Shrubs or low trees, with deciduous, opposite and entire lvs.: fls. in loose panicles from lateral buds at the end of last year's branches, white; corolla divided nearly to the base in 4 narrow petals; stamens 2, short: fr. a 1-seeded oval drupe. Two species in E. N. Amer. and China. Ornamental shrubs, with large, dark green foliage, and very showy white fls. in early summer. The American species is almost hardy north, but requiring a somewhat sheltered position; the Chinese may be more tender, but it thrives in W. New York. They thrive best in a somewhat moist and sandy loam, and in a sunny position. Prop. by seeds sown in fall or stratified; increased also by layers and by grafting under glass or budding in the open air on ash seedlings (in Europe *Fraxinus Ornus* is preferred); sometimes by cuttings from forced plants in early spring.

Virgínica, Linn. Fig. 438. Large shrub or slender tree, to 30 ft.: lvs. oval or oblong, acuminate, pubescent beneath when young, mostly glabrous at length, 4–8 in. long: panicles 4–6 in. long, pendulous; petals 1 in. long: fr. dark blue, oval, 1 in. long. May, June. From Penn. to Fla. and Tex. L.B.C. 13: 1264. Gt. 16:564. Mn. 2: 154. G.F. 7: 325.—Variable in shape and pubescence of the lvs., and several varieties have been distinguished, but none of them sufficiently distinct for horticultural uses. Handsome shrubs.

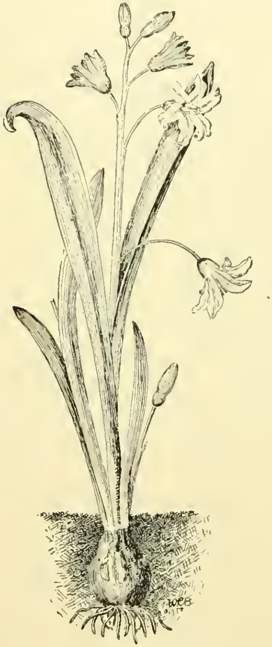
C. retùsa, Lindl. (C. Chinensis, Max.). Lvs. obovate, obtuse or acute, sometimes emarginate: petals shorter and broader, oblong; panicles more compact, shorter and erect. China. P.F.G. 3, p. 85. G.C. II. 23:821. Gt. 35, p. 667. A.G. 13:374. Mn. 2:157. G.F. 7:327? A.G. 20:107.

ALFRED REHDER.



438. Chionanthus Virginica. (× ½.)

CHIONODÓXA (Greek, *snow* and *glory*). *Liliàceæ.* A small genus of hardy bulbous plants. Natives of Crete and Asia Minor (Mt. Taurus). Very closely allied to Scilla, but differs, among other characters, in having a short tube to the corolla. Fls. small and blue (running into white and red forms), with recurved-spreading acute segments, dilated filaments, and small or capitate stigma. These are among the best of early-flowering plants, blooming in February, March and April, according to the locality, with the early Snowdrops and Scillas. Since their introduction to cultivation by Mr. Maw in 1877, they have been widely cultivated under the popular name of "Glory of the Snow," in allusion to their early blooming habit. *C. Luciliæ* is the most widely cultivated species. This varies much in color, the type having fls. whose petals are more or less deeply tipped with blue, shading to white at their bases. *C. Luciliæ* also occurs with pure white fls., and in reddish and pink forms. *C. Sardensis* has smaller fls. of a deeper tone of blue and without the white markings of the petals. There are two varieties of this, one with white and the other with black stamens. Chionodoxas hybridize with Scilla, and the hybrids are sometimes known as Chionoscillas.



439. Chionodoxa Luciliæ (× ½).

Chionodoxas thrive in any fertile soil, well drained and not too heavy, and in any exposure, the main requisite for growth being that they have light and an adequate supply of moisture while growing and till the foliage is ripened. The bulbs should be planted about 3 inches deep, and closely, say an inch or two apart. Lift and replant about third year. They need no winter covering. They flower well in pots in winter in a coolhouse temperature. Must be forced only gently, and given abundance of air, light and moisture. They are increased by offsets and seeds, which they produce freely. Under favorable conditions, they increase rapidly by self-sown seeds. Preferably, seeds should be sown in a frame, and may be expected to germinate the following winter.

Lucíliæ, Boiss. GLORY OF THE SNOW. Fig. 439. Bulb ovoid, brown-coated: lvs. long and narrow, two or three with each stem: scape 3–6 in. high, bearing a dozen or less bright blue, more or less hanging, white-centered fls. Asia Minor and Crete. B.M. 6433. Gn. 28, p. 179.—Runs into several forms, one of which has white fls. *C. gigantèa*, Hort., is evidently a larger form of it, distinct in habit. *C. grandiflòra*, Hort., is the same. **C. Tmolùsi**, Hort., is a late-blooming form, bright blue and white.

Sardénsis, Hort. Fls. smaller, much darker blue, with no white in the eye. Sardis. Gn. 28: 505.—Probably a form of the preceding.

Crética, Boiss. & Held. Slender: fls. smaller and fewer (1–2 on a scape) than *C. Luciliæ*, white or very pale blue. Crete.—Of little horticultural value.

Álleni, Hort. (*Chionoscílla Álleni*, Hort.). Perianth segments cut to the base: habit of *C. Luciliæ*, but the white eye is indistinct. Supposed natural hybrid of *Scilla bifolia* and *Chionodoxa Luciliæ*. G.C. III. 21:191.

J. N. Gerard and L. H. B.

CHIONOSCÌLLA. Consult *Chionodoxa*.

CHINA ASTER. See *Aster*.

CHINA TREE. Consult *Melia*.

CHINKAPIN, CHINQUAPIN. See *Chestnut* and *Castanea*.

CHIRÌTA (Hindostani name). *Gesneràceæ.* Plants much like Gloxinias and Streptocarpuses; none of them in the Amer. trade. They are natives of eastern Asia. Fls. in shades of purple and blue, tubular, in clusters on the tops of short scapes.

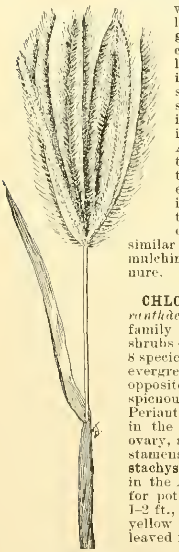
CHIVES. See *Cive*.

CHLIDÁNTHUS (*delicate flower*, from the Greek). *Amaryllidàceæ.* Two or three S. Amer. bulbs, flowering in advance of the lvs. Allied to Zephyranthes. Fls. yellow, in a small umbel, terminating a solid scape, long-tubed, with wide-spreading segments: lvs. long and strap-shaped. **C. fràgrans,** Herb., is the species in cult. It bears fragrant fls. 3–4 in. long, in summer, on scapes 15–18 in. high. It is increased by offsets or by seeds. The bulbs should be kept dry and cool during winter and in spring started in a moderately warm house. After flowering, care must be taken to have the bulbs make their annual growth. They may either be grown in pots plunged in ashes, or planted out where they can be watered occasionally during dry weather. Like other similar plants, they will benefit by a mulching of spent hops or rotted manure.

G. W. Oliver and L. H. B.

CHLORÁNTHUS (*green flower*). *Chloranthàceæ.* The type genus of a small family (25 species) of tropical herbs, shrubs or trees. Chloranthus has about 8 species. They are perennial herbs or evergreen shrubs, with jointed stems, opposite, simple lvs., and small, inconspicuous fls., in slender, terminal spikes. Perianth represented by a single scale, in the axil of which is the 1-loculed ovary, and 3 united stamens (the side stamens sometimes obsolete). **C. brachýstachys,** Blume, from Ind. and China, is in the Amer. trade. It is a shrub used for pot-growing, reaching a height of 1–2 ft., bearing glossy foliage and small, yellow berries. There is a variegated-leaved form.

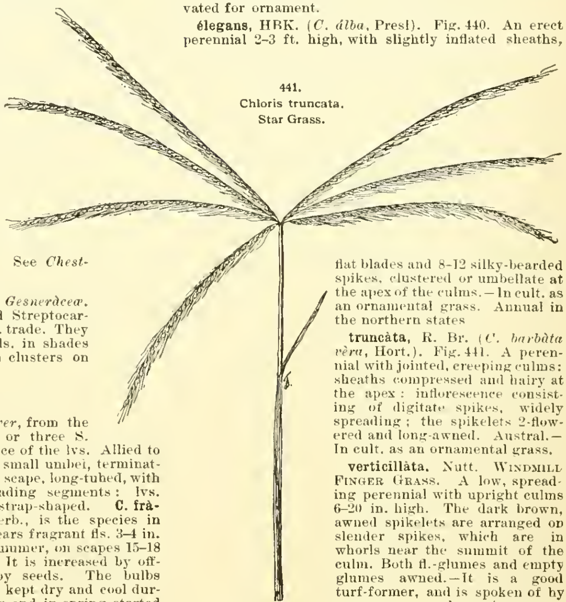
L. H. B.



440. Chloris elegans.

CHLÒRIS (Greek for *green*). *Gramíneæ.* Finger Grass. Usually perennial grasses, with flat lvs. and attractive inflorescence: spikelets 1-fld., awned, sessile in two rows along one side of a continuous rachis, forming unilateral spikes, these usually several together, and digitate at the apex of the culm. Species about 40, widely distributed through the warmer countries of the world. Several are cultivated for ornament.

élegans, HBK. (*C. álba*, Presl). Fig. 440. An erect perennial 2–3 ft. high, with slightly inflated sheaths, flat blades and 8–12 silky-bearded spikes, clustered or umbellate at the apex of the culms.—In cult. as an ornamental grass. Annual in the northern states



441. Chloris truncata. Star Grass.

truncàta, R. Br. (*C. barbàta vèra*, Hort.). Fig. 441. A perennial with jointed, creeping culms: sheaths compressed and hairy at the apex: inflorescence consisting of digitate spikes, widely spreading; the spikelets 2-flowered and long-awned. Austral.—In cult. as an ornamental grass.

verticillàta. Nutt. Windmill Finger Grass. A low, spreading perennial with upright culms 6–20 in. high. The dark brown, awned spikelets are arranged on slender spikes, which are in whorls near the summit of the culm. Both fl.-glumes and empty glumes awned.—It is a good turf-former, and is spoken of by some as a good grazing grass, and one not easily trampled out. The arrangement of the spikes gives it an odd and pleasing appearance making it useful as an ornamental species for gardens. The cult. form is an improvement on the type.

C. polydactyla, Swartz. A W. Indian species which has been found in southern Fla., is attractive, and has long and graceful spikes.—*C. grácilis*, Dur., a native of Cent. Amer. and Mex., is another species occasionally cult. for ornament.—*C. petræa*, Swartz, found along the coast from Fla. to N. Car., is as attractive as many of the grasses grown in gardens as ornamentals.—*C. glaùca*, Vasey, is a handsome species, well deserving the attention of the florist, and is found growing in brackish marshes and along the borders of cypress swamps.

P. B. Kennedy.

CHLOROCÒDON (Greek for *green* and *bell*, alluding to the flowers). *Asclepiadàceæ.* One species from S. Afr., **C. Whiteii,** Hook. f. B.M. 5898. G.C. III. 18:243. It is now cult. in S. Fla. and S. Calif. It is a strong, woody twiner, with large opposite, cordate-ovate, thick lvs. and axillary clusters of odd fls. ¾–1 in. in diam.; corolla rotate-bell-shaped, thick, green; the segments ovate and acute, purple at the base inside, and bearing long-notched lobes; anthers connivent over the capitate stigma. The roots are used medicinally in Natal, under the name of Mundi. The plant is an interesting greenhouse climber, but not handsome.

L. H. B.

CHLORÓGALUM (*green* and *milk*, from the Greek, referring to the juice of the plant). *Liliàceæ.* Three species of California, allied to Camassia (*C. Leichtlinii*, Baker = *Camassia Leichtlinii*). Bulbous: fls. white or pink, in a panicle terminating a leafy stem; segments of perianth 3-nerved, at length twisting over the ovary; style long and deciduous: lvs. with wavy margins. Plants of easy culture, to be treated like Camassias or Ornithogalums. Monogr. by Baker, Journ. Linn. Soc. 13:291; Watson, Proc. Amer. Acad. 14:242.

A. *Pedicels nearly as long as the fls.: segments spreading from near the base.*

pomeridiànum, Kunth. SOAP-PLANT. AMOLE. Stem reaching 3 ft., many-branched, from a very large bulb: fls. small (1 in. or less long) and star-like, numerous, white, with purple veins, on spreading pedicels, opening in the afternoon.—Bulb used by Indians and Mexicans for soap-making.

442. Chorizema ilicifolium. (× ⅓.)

AA. *Pedicels very short: segments spreading from above the base.*

parviflòrum, Wats. Bulb small (1 in. in diam.): stem 1–3 ft., slender-branched: lvs. narrow and grass-like: fls. pinkish, ¼ in. long: ovary broad and acute.

angustifòlium, Kellogg. Low, about 1 ft. Resembles the last, but fls. white and green-lined and somewhat larger, the ovary acute above. L. H. B.

CHLOROPHŸTUM (name means, in Greek, *green plant*). *Liliàceæ*. Very closely allied to Anthericum, but differing in the thickened filaments of the stamens and the 3-angled or 3-winged capsule; inflorescence often denser; lvs. broader, often oblanceolate and petiolate: seed disk-like. About 40 species, in Asia, Africa, and S. Amer. Consult *Anthericum* and *Paradisea*.

elàtum, R. Br. (*Anthericum variegàtum, vittàtum, picturàtum, Williamsii*, Hort.). Root fleshy and white: lvs. freely produced from the crown, often 1 in. wide, flattish and bright green, or in the garden varieties with white lines along the margins, and often (var. *picturatum*) also with a yellow band down the center: scape terete and glabrous, 2–3 ft. high, branched: fls. white, ½ in. long, with revolute, oblanceolate segments, which are obscurely 3-nerved on the back. S. Africa. F.S. 21:2240–1. —A valuable and common plant for vases and pots, and sometimes used in summer borders. *Anthericum Californicum*, Hort., is perhaps a form of it. L. H. B.

CHLORÓPSIS BLANCHARDIÀNA. See *Trichloris*.

CHOCOLATE. See *Theobroma*.

CHÓISYA (J. D. Choisy, Swiss botanist, 1799–1859). *Rutàceæ*. One Mexican shrub, **C. ternàta**, HBK., grown in S. Calif. and S. Fla., and sometimes under glass. It grows 4–8 ft. high, making a compact, free-blooming bush, with opposite, ternate lvs., the lfts. lance-obovate or oblong, thick and entire, with pellucid dots: fls. in a terminal, forking cluster, white, fragrant, orange-like (whence the vernacular name Mexican Orange), 1 in. across. R.H. 1869:330. Gn. 50, p. 203. J.H. III. 34:253. —A handsome shrub, worthy of greater popularity. It will endure several degrees of frost, and should succeed in the open in many of the southern states. Blossoms in summer. L. H. B.

CHOKE CHERRY is *Prunus demissa* and *P. Virginiana*.

CHONDRORÝNCHA (*cartilage* and *beak*). *Orchidàceæ*, tribe *Vándeæ*. Three species of S. Amer. epiphytal orchids. Cult. as for *Odontoglossum crispum*. They are practically unknown in the Amer. trade. They are short-stemmed herbs without pseudobulbs, and oblong, plicate, petioled lvs., the simple scape bearing a single large, odd, yellowish flower. *C. Chéstertoni*, Reichb. f., *C. fimbriàta*, Reichb. f., and *C. ròsea*, Lindl., are the species. Keep cool and moist.

CHORÍSIA (Greek, *separate* or *distinct*). *Malvàceæ*. A very few spiny trees, of tropical America. Lvs. alternate, digitate, of 5–7 leaflets: fls. large, with linear or oblong petals, the peduncles axillary or racemose: ovary 5-loculed and many-ovuled. **C. speciòsa**, St. Hil., of Brazil, the "Floss Silk Tree," is cult. in S. Calif., and is adapted to warm glasshouses. It is a medium-sized tree, allied to Eriodendron and Bombax. Lfts. lanceolate, acuminate, dentate: calyx irregular, shining outside, but silky inside: petals obtuse, yellowish and brown-striped at the base, pubescent on the back. L. H. B.

CHORIZÈMA (fanciful Greek name). Sometimes spelled *Chorozema*. *Leguminòsæ*. Fifteen to 20 Australian shrubs, of a diffuse or half-climbing habit, with thick and shining simple evergreen lvs. and pea-like red or yellow fls.: ovary villous. Handsome plants for the cool greenhouse, less popular in this country than abroad. When not grown too soft, they will stand slight frost at times. Grown in the open in S. Calif. and S. Fla. They are grown in a rather peaty soil, after the manner of Azaleas. Usually rested in the open in summer. They are excellent for training on pillars and rafters. Prop. easily by cuttings; also by seeds.

vàrium, Benth. Lvs. roundish or round-ovate, somewhat cordate, spiny-toothed: fls. orange and red, in erect racemes.—The commonest species. Runs into many forms, of which *C. Chándleri* and *C. grandiflòrum*, Hort., are examples.

ilicifòlium, Labill. Fig. 442. Lvs. ovate or lance-ovate, deeply repand-spiny-toothed: fls. yellow and red.

macrophŷllum, Hort. Dwarf: fls. red. L. H. B.

CHOROGI. See *Stachys*.

CHRIST-AND-THE-APOSTLES. Fanciful name of *Crinum scabrum*, which sometimes has 13 flowers.

CHRYSALIDOCÁRPUS (Greek for *golden fruit*). *Palmàceæ*, tribe *Arèceæ*. Spineless, stoloniferous palms, with medium, fasciculate, ringed stems; lvs. pinnatisect; long-acuminate segments about 100, bifid at the apex, the lateral nerves remote from the midrib. Species 2, one of them being a popular florist's plant. Madagascar.

lutéscens, H. Wendl. (*Hyophórbe Indica*, Gaertn. *H. Commersoniàna*, Mart. *Arèca lutéscens*, Bory). Figs. 443, 444. Stem 30 ft. high, 4–6 in. in diam., cylindrical, smooth, thickened at the base; lvs. very long; segments almost opposite, lanceolate, 2 ft. long, 2½ in. wide, acute, with 3 prominent primary nerves, which are convex below and acutely 2-faced above. Bourbon. A.G. 13:141. A.F. 4:566. —Fig. 443 is from Martius' Natural History of Palms. In growing *Chrysalidocarpus* (or *Areca*) *lutescens* in quantity, it will be found a good plan to sow the seeds either on a bench, in boxes or seed-pans, so prepared that the seedlings will remain in the soil in which they germinate until they have made two or more leaves. The first leaf made above the soil is small, and if plants are potted off at this stage they must be very

443. Chrysalidocarpus lutescens.

carefully watered in order not to sour the soil. In the preparation of the receptacles for the seed, a little gravel in the bottom will be found good, as the roots work very freely through it, and when the time comes to separate the plants previous to potting, it is an easy matter to disentangle the roots without bruising them. Probably the plan which works best is to wash the soil and gravel entirely from among the roots. Pot in soil not too dry, and for the next few days keep the house extra warm and humid, and the plants shaded from the sun without any moisture applied to the soil for the first few days.

444. Chrysalidocarpus lutescens.

Jared G. Smith and G. W. Oliver.

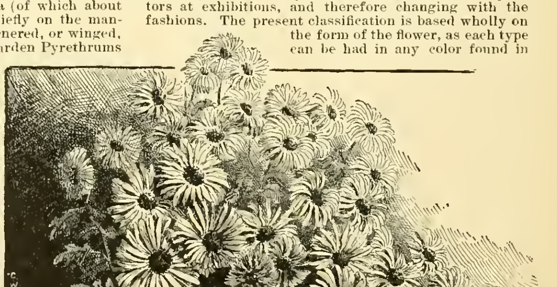
CHRYSÁNTHEMUM (Greek, *golden flower*). Including *Pyrèthrum*. *Compósitæ*. A large genus of herbaceous and sub-shrubby plants, mostly hardy, and typically with white or yellow single fls., but the more important kinds greatly modified in form and color. Bentham and Hooker make 22 subgenera (of which about 6 include the garden forms), based chiefly on the manner in which the seeds are ribbed, cornered, or winged, and the form of the pappus. The garden Pyrethrums cannot be kept distinct from Chrysanthemums by garden characters. The garden conception of Pyrethrum is a group of hardy herbaceous plants, with mostly single flowers, as opposed to the florists' or autumn Chrysanthemums, which reach perfection only under glass, and the familiar annual kinds, which are commonly called Summer Chrysanthemums. When the gardener speaks of "Pyrethrums," he usually means *P. roseum*. Many of the species described below have been called Pyrethrums at various times, but they all have the same specific name under the genus Chrysanthemum, except the most important of all garden Pyrethrums. viz., *P. roseum*, which is *C. coccineum*. The Feverfew and Golden Feather are still sold as Pyrethrums, and the only other species of importance is *P. uliginosum*.

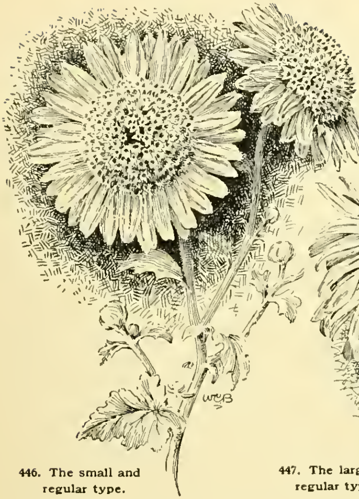
The insect powder known as "Pyrethrum," is produced from the dried flowers of *C. cinerariæfolium* and *C. coccineum*. The former species grows wild in Dalmatia, a long, narrow, mountainous tract of the Austrian empire. "Dalmatian Insect Powder" is one of the commonest insecticides, especially for household pests. *C. cinerariæfolium* is largely cultivated in France. *C. coccineum* is cult. in Calif., and the product is known as Buhach. See Lodeman, The Spraying of Plants, and Rep. U. S. Com. Agr. 1881–2, p. 76.

There are over one hundred books about the Chrysanthemum, and its magazine literature is probably exceeded in bulk only by that of the rose. It is the flower of the east, as the rose is the flower of the west. Aside from oriental literature, there were 83 books mentioned by C. Harman Payne, in the Catalogue of the National Chrysanthemum Society for 1896. Most of these are cheap cultural guides, circulated by the dealers. The botany of the two common species has been monographed by W. B. Hemsley in the Gardeners' Chronicle, series III., vol. 6, pp. 521, 555, 585, 652, and in the Journal of the Royal Horticultural Society, vol. 12, part I. The great repositories of information regarding the history of the Chrysanthemum, from the garden point of view, are the scattered writings of C. Harman Payne, his Short History of the Chrysanthemum, London, 1885, and the older books of F. W. Burbidge and John Salter. For information about varieties, see the Catalogues of the National Chrysanthemum Society (England) and the Liste Descriptive, and supplements thereto, by O. Meulenaere, Ghent, Belgium. The best book written by an American is Chrysanthemum Culture for America, by James Morton, N. Y., 1891. There are a number of rather expensive art works, among which one of the most delightful is the Golden Flower: Chrysanthemum, edited by F. Schuyler Mathews, pub. by Prang, Boston, 1890.

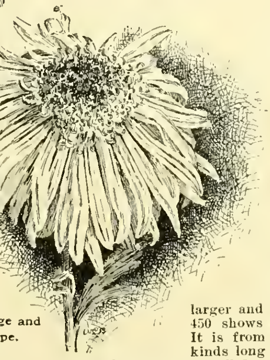
Types of the Common Chrysanthemum.—The common Chrysanthemums of the florists are also called "large-flowering," and "autumn Chrysanthemums," though neither of these popular names is entirely accurate or distinctive. They are the blended product of *C. Indicum* and *C. morifolium* (or *C. Sinense*), two species of plants that grow wild in China and Japan. From 10 to 15 dominant types are recognized by the National Chrysanthemum Society of England.

The words "types," "races," and "sections," have always been used by horticulturists to express much the same thing, but types can always be clearly defined, while sections cannot, and the word race should be restricted to cultivated varieties that reproduce their character by seed, which is not the case with the large-flowering Chrysanthemums. The following explanation and scheme, it is hoped, will clearly set forth the main types, and explain some of the many terms that confuse the beginner. The horticultural sections are wholly arbitrary, being chiefly for the convenience of competitors at exhibitions, and therefore changing with the fashions. The present classification is based wholly on the form of the flower, as each type can be had in any color found in


445. Type of single Chrysanthemum.



446. The small and regular type.



447. The large and regular type.

446–449. The anemone-flowered types of Chrysanthemums.

the whole genus. For examples of each type, see N. C. S. catalogues.

A. *Single forms: rays in 1 series, or few series: disk low and flat.*

1. *The Small Single Type.*—Fig. 445. Fls. about 2 in. across, star-like, *i.e.*, with the rays arranged in one series around the yellow disk. "Single," however, is a relative term, and in Fig. 445 there are really several series of rays, but they do not destroy the "singleness" of effect. All fls. are either single, semi-double, or double, but all the intermediate forms between the two extremes of singleness and doubleness tend to disappear, as people usually do not like them.

2. *The Large Single Type.*—Like Fig. 445, but the fls. 4 in. or more across, and fewer. The difference between the large and small single types is admirably shown in Gn. 37:756. These types are practically never grown outdoors and are best suited for pot culture, each specimen bearing 20–80 fls.

AA. *Anemone-fld. forms: rays as above: disk high and rounded.*

B. *Fls. small, numerous, regular.*

3. *The Small Anemone Type.*—Commonly called "Pompon Anemone." Fig. 446. Fls. 2 or 3 inches across, and usually more numerous than in the large anemone type. All the anemone forms are essentially single, but the raised disk, with its elongated, tubular fls., usually yellow but often of other colors, gives them a distinct artistic effect, and they are, therefore, treated as intermediates in character between the single and double forms. Like the single forms, they are less popular than the double kinds, and the varieties are, therefore, less numerous and more subject to the caprices of fashion.

BB. *Fls. large, fewer, regular.*

4. *The Large Anemone Type.*—Fig. 447. Fls. 4 in. or more across and fewer. Gn. 9, p. 33.

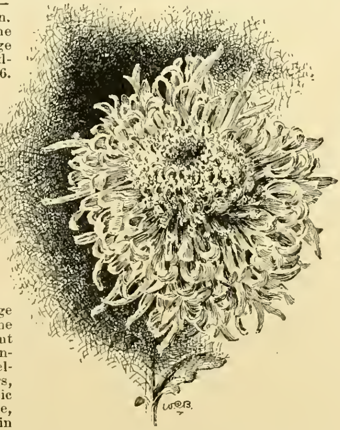
BBB. *Fls. large, few, irregular.*

5. *The Japanese Anemone Type.*—Figs. 448, 449. Fls. 4 in. or more across, and irregular in outline. H. Rider Haggard is an excellent example. Gn. 47, p. 161; 31:601.

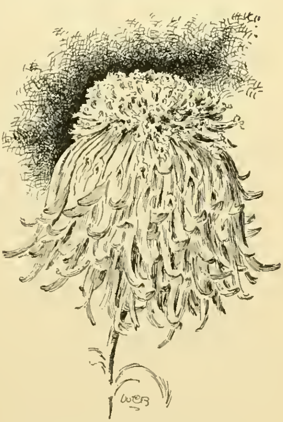
AAA. *Double-fld. forms: rays in many series: disk absent or nearly so.*

B. *Fls. small: rays short.*

6. *The Pompon Type.*—Fig. 450. Fls. 1–2 in. across. The outdoor kinds are likely to be small, flat and button-like, while those cult. indoors are usually larger and nearly globular. Fig. 450 shows the former condition. It is from one of the old hardy kinds long cultivated in the gardens as "Chinese" or "small-flowered" Chrysanthemums, and generally supposed to be the product of *C. Indicum*, as opposed to the "Japanese" or "large-flowered" kinds introduced in 1862, which marked a new era by being less formal and more fanciful than any of the preceding kinds. Pompons are little cult. under glass in Amer. The Pompon section of the N.C. S. Cat. 1896 refers to indoor types, and a separate section was made for the outdoor types under the name of "Earlies," with two subgroups, "Pompons" and "Japanese," referring to the old small-flowered, hardy race, and the new large-flowered Japanese kinds, which are grown to perfection only under glass, but are sometimes grown outdoors, though they are usually less hardy.



448. The large and irregular type. An early stage.



449. The large and irregular type. At a later stage of development.

BB. *Fls. large.*

C. *Blossoms hairy.*

7. *The Hairy Type.*—Also called "Ostrich Plume" and "Japanese Hairy." The famous prototype is the variety Mrs. Alpheus Hardy, pictured in Gn. 35, p. 307, which was sold for $1,500 in 1888, and started the American craze. White fls. with long hairs are very delicate and pretty, but the hairs are often minute, and on many of the colored fls. they are considered more curious and interesting than beautiful. So far, nearly all hairy Chrysanthemums are of the Japanese Incurved type.

CC. *Blossoms not hairy.*

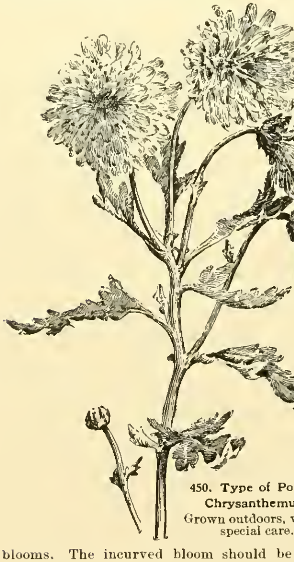
D. *Rays reflexed.*

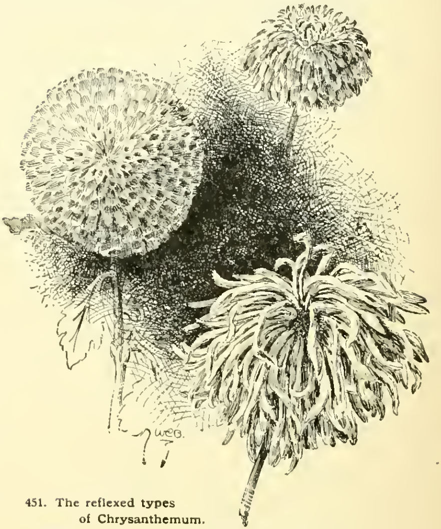
8. *The Reflexed Type.*—Also called "Recurved." Fig. 451. The reflexed forms can be easily broken up into three types, (*a*) the small and regular, (*b*) the large and regular, and (*c*) the large and irregular types. Lately the irregular kinds have been removed by the N. C. S. from a section called "Japanese Reflexed" into the "Japanese" section, which section, as explained under No. 11, means little more than "miscellaneous."

DD. *Rays incurved.*

E. *Form absolutely regular.*

9. *The Incurved Type.*—Fig. 452 shows the general idea, but such a flower would hardly win a prize at an English show, where anything short of absolute regularity is relegated to the "Japanese Incurved" section (No. 10). This type is by far the most clear-cut ideal of any of these types, and for many years this ideal of the florists has so completely dominated the English Chrysanthemum shows that the incurved section has come to be known there as the "exhibition" or "show type." In Amer. the Japanese types, which are less formal and fanciful, prevail, but in England this is the most important section of all. The N.C.S. Cat. for 1896 says: "The distinguishing characteristics of the incurved varieties are the globular form and regular outline of the blooms. The incurved bloom should be as nearly a globe as possible, as 'depth' is an important point in estimating its value; the florets should be broad, smooth, round at the tip, and of sufficient length to form a graceful curve. They ought to be regularly arranged, and the color clear and decisive. A hollow center or a prominent eye is a serious defect, as also are a roughness in the bloom's or unevenness in outline, and a want of freshness in the outer florets." A perfect picture of this ideal of the florists may be seen in Gn. 9, p. 269, or A.F. 5:5. Such blooms are "dressed" with tweezers so that the rays all overlap one another in perfect order. Each flower is shown separately without foliage, while the prevailing American idea in exhibition is a mass effect, with a vase of 12 or more long-stemmed fls., usually of the same variety.


450. Type of Pompon Chrysanthemum.
Grown outdoors, with no special care.


451. The reflexed types of Chrysanthemum.
Small and regular; large and regular; large irregular.

EE. *Form more or less irregular.*

10. *The Japanese Incurved Type.*—Fig. 452 would be referred to this type by the English florists, together with all of the many other forms that are not globular and entirely regular. This section and the next are the most important in America. There are many variations of this type. It often happens that the outer 4 or 5 series of rays gradually become reflexed, but if most of the rays are incurved, the variety may be exhibited in this section.

DDD. *Rays of various shapes: forms various.*

11. *The Japanese Types.*—Plate VI. The word "Japanese" was originally used to designate the large-fld. fantastic kinds, introduced by Robert Fortune from Japan in 1862. It has never been restricted to varieties imported directly from Japan, but has always included seedlings raised in the western world. Before 1862, all florists' fls. in England were relatively formal and small. The informal, loose, fantastic, Japanese Chrysanthemums, introduced by Fortune in 1862, broke up the formal era, and the craze for large specimen blooms which resulted in flower-shows all over the world reached America in 1889. The "Japanese section" of the National Chrysanthemum Society now means little more than miscellaneous. The 10 types previously mentioned can be rather accurately defined, but the Japanese section is purposely left undefined to include everything else. All the tubular and quilled sorts are now included in it, though formerly kept distinct.

Marked forms are Laciniatum, Lillian B. Bird, Millbrook, Mrs. W. H. Rand, A. H. Wood, Shavings, Northern Lights.

Relative Importance and Uses of the Types.—In general, the large-fld. forms are more popular than the small-fld. forms, especially at exhibitions, where great size is often the greatest factor in prize-winning Types 9, 10 and 11 are the most important in America, especially the Japanese section. The fls. of types 9 and 10 are likely to be more compact and globular, and hence better for long shipments than the looser and more fanciful types. Types 9, 10 and 11 are the ones to which most care is given, especially in disbudding and training. They are the ones most commonly grown by the florists for cut-fls. and whenever one large fl. on a long stem is desired. The anemone-flowered forms are all usually considered as curiosities, especially the Japanese Anemones, which are often exhibited as freaks and oddities. The single and anemone-flowered forms are used chiefly for specimens in pots with many small fls., but all the other types are used for the same purpose. For outdoor culture, the hardy Pompons, with their numerous small fls., are usually better than the large-flowering or Japanese kinds. In America, the Chrysanthemum ranks fourth in economic importance, although its season is practically only six weeks, while the season of the florists' roses, carnations and violets is from six to nine months. If one were to put a guess in the form of figures, it might be said that possibly 60 per cent of all American Chrysanthemums are raised for cut-fls., 30 per cent for potted plants, while 10 per cent are hardy old-fashioned Pompons cultivated outdoors.

W. M.

SECTION I.—CULTURE OF THE LARGE-FLOWERED CHRYSANTHEMUMS GROWN UNDER GLASS (*C. Indicum* × *morifolium*).

Introduction and General Principles.—The first step towards success is good, healthy cuttings, and as they become established plants they should receive generous culture throughout their entire growing season. This requires close attention to watering, airing, repotting, and a liberal supply of nutriment.

Chrysanthemums are propagated in four ways,—by cuttings, division, seeds, and grafting. By far the most important is the first, because it is the most rapid. It is the method of the florists. In localities where the plants can remain outdoors over winter without injury, they may be increased by division. This system is practiced more by amateurs than florists, being the easiest method for the home garden but not rapid enough for the florist. Propagation by seeds is resorted to only to produce new varieties, and is discussed at length under subsection IV. Grafting is very rare. Skilful gardeners sometimes graft a dozen or more varieties on a large plant, and the sight of many different colored fls. on the same plant is always interesting at exhibitions.

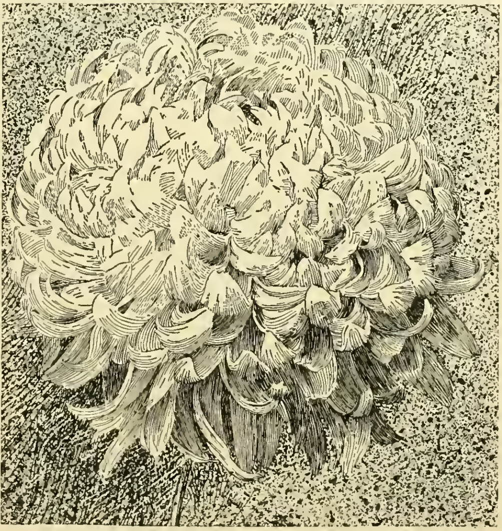
Subsection I.—Culture of Chrysanthemums for cut-flowers.

This is the method chiefly employed by florists, the plants being grown in benches.

1. *Propagation by Cuttings.*—Plants of the preceding year afford stock from which to propagate the following season. They produce quantities of stools or suckers, which form excellent material for the cuttings. These are generally taken from 1–2½ in. in length, the lower lvs. removed, also the tips of the broad lvs., then placed in propagating beds close together, where they are kept continually wet until rooted. To insure a large percentage, the condition of the cuttings should be moderately soft. If the stock plants are allowed to become excessively dry, the cuttings are likely to harden, and thus be very slow in producing roots. Single-eye cuttings may be used of new and scarce varieties when necessary. These are fastened to a toothpick with fine stemming-wire, allowing half of the toothpick to extend below the end of the cutting, and when inserted in the cutting-bed the end of the cutting should rest upon the sand. It requires more time to produce good plants by this system than where fair-sized cuttings can be taken, but it is often of service where stock is limited. The propagating house should be well aired, and it is advisable to change the sand after the second or third batch of cuttings has been removed, to avoid what is termed cutting-bench fungus. The cuttings should never be allowed to wilt, and this is avoided by giving abundance of air, and when the temperature reaches over 70° from sun heat, by shading with some material, either cloth or paper.

2. *Planting.*—Cuttings should not be allowed to remain in the cutting-bench after the roots are ½ in. in length, or they will become hardened, which will check the growth. As soon as rooted, they should be potted into 2-in. or 2½-in. pots, using good, mellow soil with a slight admixture of decomposed manure. Most of the large fls. are produced under glass, and the bench system is generally employed, which consists of 4 or 5 in. of soil placed upon benches. In these benches the small plants are planted 8–12 in. apart each way, from the latter part of May to the middle of July. Those planted at the first date generally give the best results. The soil should be pounded rather firm either before planting or after the plants have become established.

3. *Soil.*—There are many ideas as to what soil is best suited for the Chrysanthemum, but good blooms may be grown on clay or light, sandy loam, provided the cultivator is a close observer and considers the condition of the soil in which they are growing. Clay soil, being more retentive of moisture, will require less water and feeding than soil of a more porous nature. The Chrysanthemum is a gross feeder, and, therefore, the fertility of the soil is very important in the production of fine

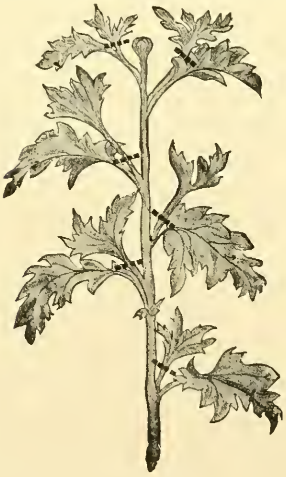


452. Type of Japanese Incurved Chrysanthemum.

blooms. Each expert has a way of his own in preparing the soil, but as equally good results have been obtained under varied conditions, it is safe to conclude that the method of preparing the soil has little to do with the results, provided there is sufficient food within their reach. All concede that fresh cut sod, piled late the preceding fall or in early spring, with ½ to ⅓ its bulk of half-decomposed manure, forms an excellent compost. Many use 1 or 2 in. of manure as a mulch after the plants have become established. Others place an inch of half-decomposed manure in the bottom of the bench. This the roots find as soon as they require it. Good blooms have been grown by planting on decomposed sod and relying on liquid applications of chemicals.

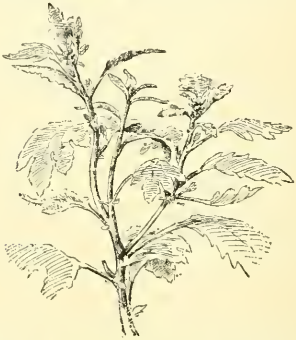
453. One kind of Chrysanthemum cutting.

4. *Feeding.*—No definite rule can be given for this work, as so much depends on the amount of food incorporated in the soil. If the soil be very rich, the liquid applications should be only occasional and very dilute. There is more danger of overfeeding by the use of liquids than by using excessively rich soil. Each grower must depend on his own judgment as to the requirements, being guided by the appearance of the plants. When the lvs. become dark colored and very brittle, it is safe to consider that the limit in feeding has been reached. Some varieties refuse to bud when overfed, making a mass of lvs. instead. Others show very contorted petals, giving a rough, unfinished bloom. Still others, particularly the red varieties, are likely to be ruined by decomposition of the petals, called burning, especially if the atmosphere is allowed to become hot and stuffy. The same result will follow in dark weather, or when the nights become cool, if the moisture of the house is allowed to fall upon the blooms. Under such conditions, the ventilation should remain on every night, or heat be turned in according to the outside temperature.


454. Crown bud of Chrysanthemum at an early stage.

Showing the shoots to be removed if the crown bud is to be saved.

5. *Watering.*—Let the foliage be the index to watering. If it appears yellow and sickly, use less water, and see that the drainage is perfect. There is but little danger of overwatering as long as the foliage is bright green. A little shading at planting time is not objectionable, but it should be removed as soon as the plants are established. It is often necessary to shade the pink and red flowers if the weather continues bright for some time, to prevent their fading.

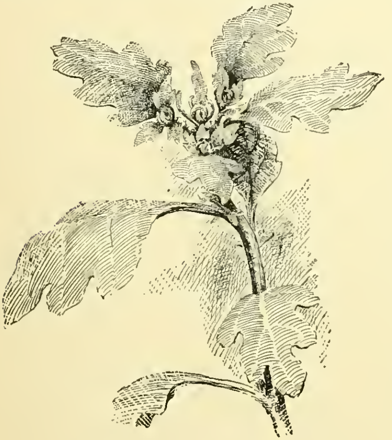

455. Crown bud of Chrysanthemum at a later stage.

Showing how its strength is sapped by the shoots beneath, which are just showing clusters of terminal buds.

6. *Training.*—When the plants are 8 in. high, they should be tied either to stakes or to jute twine. In the former system, use one horizontal wire over each row, tying the stake to this after the bottom has been inserted into the ground. Two wires will be necessary where twine is used, one above the plants and the other a few inches above the soil. From the first of August until the flowers are in color all lateral growths should be removed as soon as they appear, allowing only the shoots intended for flowers to remain. The above remarks refer to the training of benched Chrysanthemums as grown by florists for cut-flowers. Other kinds of training are described under *Subsection II.*

7. *Disbudding.*—No special date can be given for this work, as much depends on the season and the earliness or lateness of the variety to be treated. Buds usually begin to form on the early sorts about Aug. 15, or soon after, and some of the late varieties are not in condition before Oct. 10. The object of removing the weak and small buds and retaining the best is to concentrate the whole energy of the plant and thereby increase the size of the flower. There are two forms of buds, crowns and terminals. A crown bud is formed first, never comes with other flower-buds, and is provided with lateral growths which, if allowed to remain, will continue their growth and produce terminal buds later. Terminal buds come later, always in clusters, are never associated with lateral growths, and terminate the plant's growth for that season. If the crown bud is to be saved, remove the lateral growths as shown by the dotted lines in Fig. 454, and the operation is complete. If the terminal bud is desired, remove the crown and allow 1, 2 or 3 (according to the vigor of the plant) of the growths to remain. In a few weeks these will show a cluster of buds, and, when well advanced, it will be noticed that the largest is at the apex of the growth (the one saved, if perfect, as it usually is), and one at each of the leaf axils (see Fig. 456). The rejected buds are easiest and safest removed with the thumb and forefinger. Should the bud appear to be one-sided or otherwise imperfect, remove it and retain the next best. In removing the buds, begin at the top and work down. By so doing there are buds in reserve, in case the best one should accidentally be broken, while if the reverse course were taken, and the best bud broken at the completion of the work, all the labor would be lost. A few hours' disbudding will teach the operator how far the buds should be advanced to disbud easily. Early and late in the day, when the

growths are brittle, are the best times for the work. Some growers speak of first, second and third buds. The first is a crown, and generally appears on early propagated plants from July 15 to August 15. If removed, the lateral growths push forward, forming another bud. In many cases where the crowns are removed early, the next bud is not a terminal, but a second crown, which is termed the second bud. Remove this, and the third bud will be the terminal. Plants propagated in May and June generally give the second and third bud, not forming the typical crown. Those struck in July and planted late give the terminal only. Most of the best blooms are from second crown and terminal. Pink, bronze and red flowers from first crowns are much lighter in color than those from later buds. They are large, but very often abnormal to such an extent as to be decidedly inferior. This is doubtless due to the large amount of food utilized in their construction, owing to the long time consumed in development. The hot weather of September and October must have a detrimental effect upon the color. Consult Figs. 454–457.


456. Terminal buds of Chrysanthemum at an early stage.
None too early for disbudding.

8. *Enemies.*—Green and black aphis are the most destructive insects. Through the summer months tobacco dust broadcasted over the plants is an effective remedy. At the approach of cool weather it is best to resort to light fumigations of tobacco. Grasshoppers are sometimes very destructive. Handpicking is conceded to be the best method, although if there are quantities of small ones a weak solution of Paris green may be resorted to.

Subsection II.—Culture of Chrysanthemums in pots.

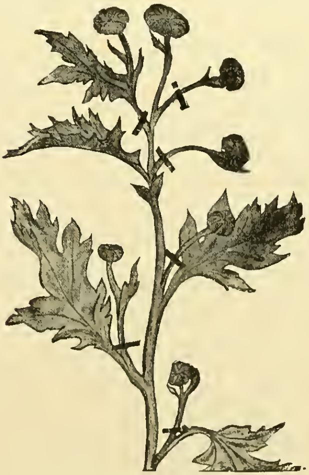
The same principles are employed in pot culture as when planted upon the bench, with the exception that the plants are generally allowed to produce more blooms. The most popular type of pot plant for home growing, or for sale by florists and intended for home use, is a compact, bushy plant, 1½–2 ft. high, branched at the base, and bearing from 4–20 fls. averaging 3–4 in. across. They are here called "market plants." "Single-stem plants" are also popular. Great quantities of large fls. (say 20–100) are rarely grown on a potted plant, except for exhibitions. Such plants are commonly called "specimens," and the three leading forms are the bush, the standard and the pyramid.

1. *Market Plants.*—Dwarf plants of symmetrical form, with foliage down to the pots, are the most salable, and, when thus grown, require constant attention as to watering and stopping, allowing each plant plenty of room to keep the lower leaves in a healthy condition. Cuttings taken June 1 and grown in pots, planted on old carnation benches or in spent hotbeds (light soil preferable), and lifted by August 15, will make very nice plants 1–1½ ft. high. The reason for lifting early is to have them well established in their flowering pots before the buds are formed.

2. *Single-stem Plants.*—Same culture as market plants, except that they are restricted to one stem and flower. Those from 1–2 ft. in height are more effective and useful than tall ones. For this reason many prefer plunging the pots out of doors where they have the full benefit of the sun and air, making them more dwarf than when grown under glass.

3. *Pot Plants for Cut-flowers.*—Culture same as for specimen plants, except that the nipping should be discontinued July 1 to give sufficient length to the stems. If large flowers are desired, restrict the plants to 8 or 10 growths. Such plants can be accommodated in less space than specimens, where the chief object is symmetry.

4. *Bush Plants.*—For large bush plants, the cuttings should be struck early in February, and grown along in a cool, airy house, giving attention to repotting as often as necessary. The final potting into 10- or 12-inch pots generally takes place in June. They are potted moderately firm, and watered sparingly until well rooted. As soon as the plants are 5 or 6 in. high the tips should be pinched out, to induce several growths to start. As the season advances and the plants make rapid growth, pinching must be attended to every day up to the latter part of July, to give as many breaks as possible and keep them in symmetrical form. By the middle of August (if not previously attended to), staking and getting the plants in shape will be a very important detail. If stakes are used, they must be continually tied-out, as the stems soon begin to harden, and this work can be best accomplished by looking them over daily. Light stakes of any material may be used. Many other methods are in use, such as wire hoops and wire frame-work, to which the growths are securely tied.


457. Terminal buds at a later stage.
The top one is usually the strongest, and being retained, is called "the terminal bud." The others should have been removed long before they were as large as here shown.

5. *Standards* differ from bush plants in having one stout, self-supporting stem, instead of many stems. They require the same culture as bush plants, with the exception that they are not stopped, but allowed to make one continuous growth until 3, 4 or 5 ft. high, and are then treated the same as bush plants. They will require the same attention as to stopping and tying to secure symmetrical heads.

6. *Pyramids* are only another form of bush plants, and it is optional with the grower which form he prefers.

Subsection III.—Culture of Chrysanthemums for the production of new varieties.

The object of seed-saving is the improvement of existing varieties. It is not conclusive, however, that all seedlings will be improvements; in fact, it is far from this, as the greater portion are inferior to their antecedents. Only those who give the most careful consideration to cross-fertilization are certain of marked success. Hand-hybridized seeds possess value over those haphazardly fertilized by wind and insects only according to the degree of intelligence employed in the selection of parents. What the result will be when a white flower is fertilized with a yellow one, the operator cannot determine at the outset. It may be either white, yellow, intermediate, or partake of some antecedent, and thus be distinct from either. Improvements in color can be obtained only by the union of colors, bearing in mind the laws of nature in uniting two to make the third. Red upon yellow, or vice-versa, may intensify the red or yellow—give orange or bronze, as nature may see fit. The operator is more certain of improving along other lines, such as sturdiness or dwarfness of growth, earliness or lateness of bloom, or doubleness of flowers. The selection of those most perfect in these particulars is very sure to give similar or improved results. Always keep a record of this work showing the parents of a seedling. The satisfaction of knowing how a meritorious variety was produced more than pays for the trouble, and may lead to further improvements in certain lines. The operation begins when the flower is half open, cutting the petals off close to their base with a pair of scissors, until the style is exposed. Should the flower show signs of having disk or staminate florets, remove these with the points of the scissors and thus avoid self-fertilization. When the styles are fully grown and developed, the upper surface or stigma is in condition to receive the pollen. By pushing aside (with the thumb) the ray florets of the flower desired for pollen, the disk florets which produce the pollen will become visible. The pollen may be collected on a camel's-hair pencil or toothpick and applied to the stigma of the flower previously prepared. If a toothpick be used, never use it for more than one kind of pollen. By allowing the camel's-hair pencil to stand in an open-mouthed vial of alcohol a few moments after using, it may be again used, when dry, upon another variety without fear of the pollen of the former operation affecting the present. Cuttings struck in June and July and grown to single bloom in 4-inch pots are the most convenient for seeding. Such flowers, if not given too much feed, are more natural and furnish abundance of pollen, as well as being easier to trim than the massive blooms produced for the exhibition table. The pollenizing should be done on bright, sunny days, and as early in the day as possible. As soon as the seed plants are trimmed, they should be placed by themselves to avoid fertilization by insects, and should there remain until the seeds are ripe. Keep the plants rather on the dry side, and give abundance of air. Seeds, which ripen in 5 to 6 weeks, should be saved without delay, and carefully labelled. In sowing seeds, they should be covered very lightly and kept in a temperature of 60°. When the seedlings are large enough to handle easily, remove to small pots, or transplant further apart in shallow boxes. Chrysanthemums flower the first season from seed.

Subsection IV.—Varieties.

Of the long list of new varieties sent out each year, but few are retained after the second year's trial. This is probably due to the fact that most American growers are more interested in the commercial value of the flower than the curious forms or striking colors they present. Exhibitions have not reached the hearts of the people here as in England and France. There are a few varieties that have stood the test for several years; such as Ivory, 1889; W. H. Lincoln and Minnie Wanamaker, '90; Mrs. J. G. Whilldin, '91; Mrs. Jerome Jones, Col. W. B. Smith, Mrs. A. J. Drexel, Margaret Jeffords, Jos. H. White, Geo. W. Childs, Merry Monarch, '92; Niveus, Maud Dean, The Queen, Golden Wedding, H. L. Sunderbruch, Good Gracious, Pres. W. R. Smith, '93. There are many other varieties that have stood the test for 4 or 5 years.

It is not the purpose of this article to recommend varieties of Chrysanthemums, but the following list includes the best varieties now known. The list will be valuable as showing a serviceable classification:

Selection of varieties based upon the main types.—(1) *Incurved:* Belle Poitevine, Congo, Irma, Lorelei, Mrs. T. D. Hatfield, Mongolian Prince, Mrs. Robt. Craig, Mrs. L. C. Madeira, Major Bonnaffon, Mrs. R. C. Kingston. (2) *Japanese:* Chito, Geo. W. Childs, Golden Gate, Golden Wedding, Mayflower, Modesto, Thornden, Mutual Friend, Black Hawk, Niveus, Viviand Morel, Yanoma. (3) *Japanese Incurved:* Nyanza, Mrs. W. C. Egan, Eugene Dailledouze, Georgiana Pitcher, Good Gracious, Jennie Falconer, Mrs. Geo. West, Philadelphia, The Queen, Mrs. Jerome Jones, Western King. (4) *Hairy:* Golden Hair, Louis Boehmer, Mrs. A. Hardy, R. M. Grey, White Swan, Queen of Plumes. (5) *Reflexed:* Cullingfordii, Dorothy Toler, Gold Standard, Miss Elma O'Farrell, Tuxedo, Parthenia. (6) *Large Anemone:* Ada Strickland, Descartes, Falcon, Junon, Marcia Jones, Thorpe, Jr. (7) *Japanese Anemone:* Condor, Enterprise, Mrs. F. Gordon Dexter, San Joaquin, Surprise, Satisfaction. (8) *Pompon:* Black Douglass, Golden Mlle. Marthe, Mlle. Marthe, Mrs. Bateman, Snowdrop, Wm. Kennedy. (9) *Pompon Anemone:* Antonius, Emily Rowbottom, Marie Stuart, Mme. Chalonge, Mme. Sentir, Queen of Anemones. (10) *Early Hardy Pompons:* Bronze Bride, Flora, Frederick Marronet, Mme. Jolivart, Mr. Selley, Miss Davis, Mrs. Cullingford, Mlle. Elise Dordan, Illustration, St. Mary. (11) *Single:* Mizpah, Framfield Beauty.

Selection of varieties based upon color.—*White*—Ivory, Mrs. M. A. Ryerson, Mrs. H. Weeks, Mrs. Henry Robinson, Mutual Friend, Niveus. *Pink*—Merula, Mme. F. Perrin, Helen Bloodgood, Harry Balsley, Iora, Autumn Glory. *Amaranth, Purplish Crimson, Magenta, and the like*—Casco, Mrs. A. J. Drexel, Mrs. Geo. West, Elma O'Farrell. *Crimson*—Shilowa, Black Hawk, Geo. W. Childs, John Shrimpton, Fisher's Torch, Defender. *Red and Yellow, Bronze, Buff*—Chito, Nyanza, Chas. Davis, Edwin A. Kimball, Buff Globe, Rustique, Hicks Arnold. *Yellow*—Modesto, Eugene Dailledouze, Golden Wedding, Thornden, Major Bonnaffon, Liberty.

Selection of varieties based upon special uses.—*Bush Plants:* White—Mutual Friend, Jos. H. White; Yellow—W. H. Lincoln, C. Chalfant; Pink—Viviand Morel, Iora; Bronze—Col. W. B. Smith, Hicks Arnold; Crimson—Geo. W. Childs, J. Shrimpton. *Single Stem Pot Plants:* White—Mrs. H. Robinson, Merza; Yellow—Major Bonnaffon, H. L. Sunderbruch; Pink—Mme. F. Perrin, Merula; Bronze—Boule d'Or, Rinaldo; Crimson—Geo. W. Childs, John Shrimpton. *Exhibition Blooms:* White—Frank Hardy, Fee du Champsaur, Mme. Carnot, Western King; Pink—Viviand Morel, Iora, Good Gracious; Yellow—Modesto, Golden Wedding, Eugene Dailledouze, G. J. Warren; Bronze—Chas. Davis, Rustique, Nyanza; Crimson—Geo. W. Childs, Shilowa, Black Hawk; Miscellaneous—Chito, yellowish bronze; Lady Hanham, golden cerise; Mrs. Geo. West, rosy purple. *Commercial Blooms* (based upon quality, and ease of culture: White—Ivory, Mrs. Henry Robinson, Mrs. Jerome Jones; Pink—Mrs. S. T. Murdock, Mme. F. Perrin, Glory of Pacific; Yellow—Marion Henderson, Major Bonnaffon, Yellow Mrs. Jerome Jones; Crimson—Geo. W. Childs, Shilowa, Black Hawk. *Odd Varieties:* Lillian B. Bird, Mrs. W. H. Rand, Herou's Plume, Pitcher & Manda. *Best Early:* White—Mme. F. Bergmann, Ivory, Midge, Geo. S. Kalb; Pink—Glory of Pacific, Pink Ivory, Merula, Lady Playfair; Yellow—Harry Hurrell, H. L. Sunderbruch, Marion Heuderson, Golden Trophy. *Best Late:* White—Mrs. Jerome Jones, Yanoma, Wm. H. Chadwick, Merry Christmas; Pink—Francis B. Hayes, Harry Balsley, Mrs. S. T. Murdock, Maud Dean. Yellow—W. H. Lincoln, H. W. Rieman, Liberty, Yellow Mrs. Jerome Jones.

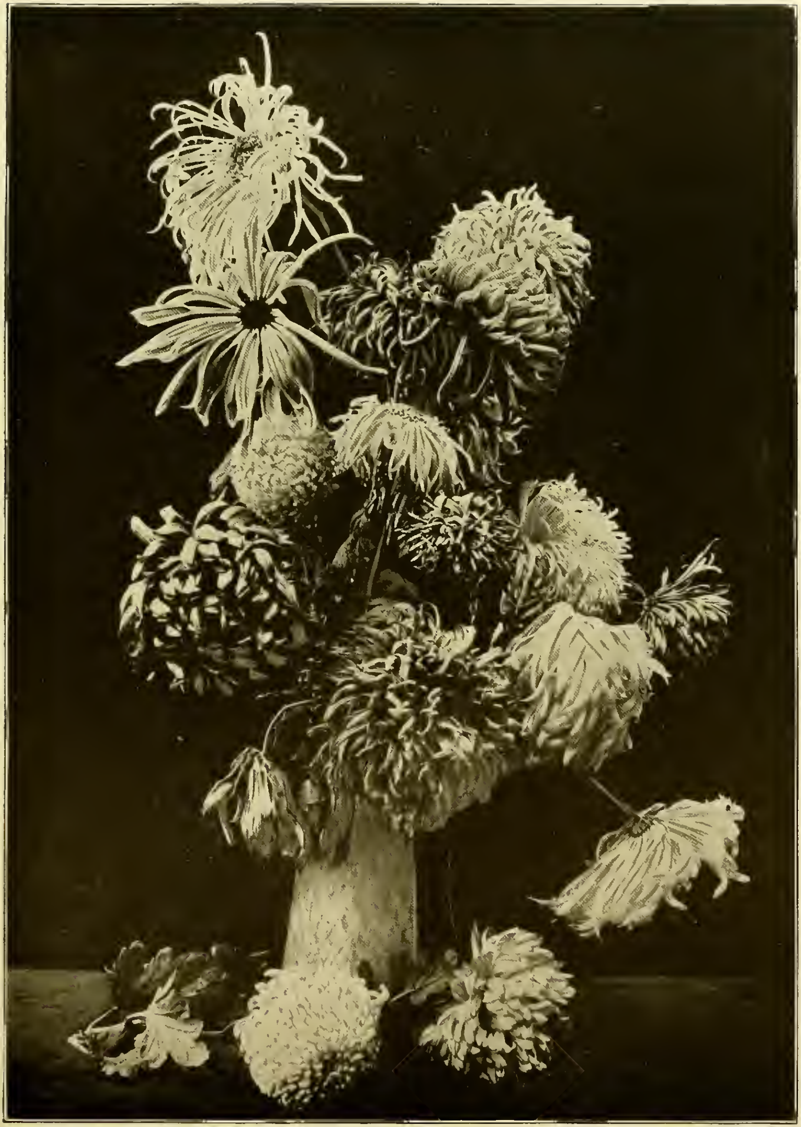


Plate VI. Chrysanthemums, mainly Japanese types

The two ball-shaped flowers belong to the Chinese or Incurved type. Specimens of the Single and Anemone types are also seen

Many of the midseason varieties are good for Thanksgiving and after if planted late. ELMER D. SMITH.

Subsection V.—Culture of Chrysanthemums for Exhibition.

This branch of cultivation naturally requires more care than any other, and the cultural side counts for very little compared with the personal qualities of the exhibitor after the fls. are delivered at the exhibition hall. Prize-winning is more like business than floriculture, and is, therefore, largely a matter of experience. It is hard to extricate any fundamental principles, but some suggestions are made under *Exhibitions*. Many towns have never seen any kind of a flower show but a Chrysanthemum show. The prizes are often larger and more specialized than with any other flower. As soon as the schedule of prizes is published the competitor should pick out the classes he intends to try for. The importance of strong stock can hardly be overstated. Novelties or highly forced plants are more likely to give poor results than selected stock carefully grown by the competitor himself. Next to a general comprehension of Chrysanthemum culture, perhaps the two most important factors in success are the quality of stock and the choice of variety. In the biggest exhibitions, novelties are classed by themselves. One of the commonest mistakes that beginners make is to depend too much upon novelties for general prizes. It is desirable to exchange visits with other growers, to take the horticultural periodicals, to master the art of shipping, and to study the analysis of successful varieties. To meet a desired date, crown buds can be used to hasten late varieties.

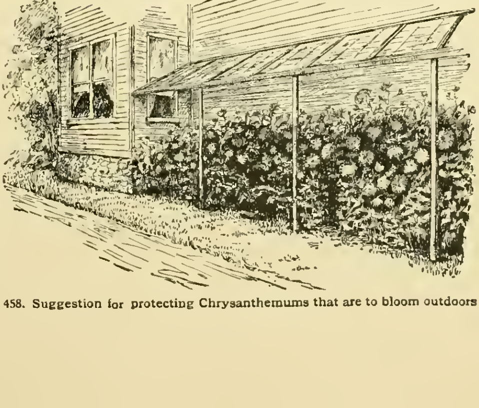
As the century closes the varieties that win the most prizes are: *White*—Mrs. Henry Robinson, Mayflower, Niveus, The Queen, Mrs. Jerome Jones, Our Mutual Friend; *Yellow*—Major Bonnaffon, Modesto, W. H. Lincoln, Golden Wedding, Miss Georgiana Pitcher; *Pink*—Viviand-Morel, Mrs. Perrin, Maud Dean; *Red*—Geo. W. Childs. W. M.

SECTION II.—CULTURE OF MARGUERITES INDOORS.

There are two types of Marguerites, the common one, or Paris Daisy, with coarser green foliage, and the glaucous Marguerites, with finer cut, glaucous foliage. The former, *C. frutescens*, is better for cut-flowers. The latter, *C. anethifolium*, is probably better for large specimens. Marguerites are standard plants with florists and in the conservatories of amateurs, being of easy culture and remarkably free from enemies. They are cultivated for two distinct purposes,—for cut-flowers and for specimen plants, young plants being used for the former purpose, and older ones for the latter. For cut-flowers, the cuttings are rooted in spring, and the florists usually keep the plants in pots all summer outdoors, though this is not necessary for amateurs, and fls. are produced during the following winter. It is sometimes said that Marguerites do not lift well in the fall after being planted out all summer in the garden, and that unrestricted root-room makes the plants too large for the best production of cut-flowers. The principles underlying the matter are as follows: in turning plants out of pots into the open ground in spring, a plant that has filled its pot well with roots tends to make a much more compact root-system in the garden than the plant that had but a few roots in its pot, and the former plant is easily lifted in the fall and with less damage to the roots. As a matter of fact, Marguerites do not belong to the class of plants that are difficult to lift in the fall, and it is only a matter of starting the cuttings early enough in spring to get the plant moderately pot-bound before it is planted out into the open ground. Specimen plants are most attractive in the second winter following the spring in which cuttings were struck. After that they are likely to become too large and straggling. While in the garden the fls. should not be allowed to form, if the main object is high-grade cut-flowers in quantity for the winter. Old plants that are unfit for further use in the conservatory may be turned out in summer and will furnish scattering bloom all summer, though the fls. are likely to be rather small. If there were sufficient demand it could be easily managed to have fls. in every month of the year. It is a great pity to cut Marguerites without any foliage. The rule is that all fls. look best with some foliage, especially their own. With a little forethought, just as many fls. can be secured, and they will look much prettier and last longer. There are very few conservatories without some Marguerites. An excellent plan is to have a number of plants in 6-inch pots from cuttings struck the previous spring. A plant looks bad at first when the fls. have been removed on sprays a foot long, but in a short time they are ready for cutting again. With a little management a succession of fls. can be maintained without making all the plants thin or unsightly. Such sprays will last a week or two in water, and the opening of the larger buds is an additional feature of beauty which is lost if fls. are cut with short stems and without foliage. ROBERT SHORE.

SECTION III.—CULTURE OF CHRYSANTHEMUMS OUT OF DOORS.

The oldest of the outdoor types are the Pompons (Fig. 450), which produce from 40–100 buttons an inch or two across, with short and regular rays. Such plants can be left outdoors all winter. A selection of these old-fashioned kinds is given on page 307, under head of "(8) *Pompon*." Since the large-flowering or Japanese types have come in, numberless attempts have been made to grow them outdoors, but with poor results. The greenhouse varieties are not so hardy. In the north they are likely to be killed by the winter. Their fls. usually lack in size, depth and symmetry, largely because there are more of them on a plant than a florist allows for his best blooms, but chiefly because they do not get as much care in general as is given to plants under glass, where space is precious. For the very best results, Chrysanthemums must be flowered under glass, and they need the greatest care and forethought practically all the year round. Half-way measures are unsatisfactory. Thus it happens that the Japanese varieties are usually unsatisfactory out of doors, and the Pompons are chosen by those who can give very little care to plants and would rather have many small fls. than a few large ones. This also partly explains why no two dealers recommend anything like the same list of Japanese varieties for outdoor culture. Nevertheless, it is possible to grow excellent fls. 4 and 5 or even 6 in. across outdoors, but it requires staking, disbudding, and some kind of temporary protection, as of a tent or glass, during frosty weather. Fig. 458 shows a cheap and simple structure of coldframe sashes resting on a temporary framework. In severe weather a canvas curtain can be dropped in front, and the window of a warm cellar in the rear opened to temper the air. Fig. 458 is taken from Garden and Forest 1:523, where J. N. Gerard has left a detailed and delightful account of his success, which is sure to rouse the enthusiasm of expert amateurs. For general outdoor culture, however, where no special care



458. Suggestion for protecting Chrysanthemums that are to bloom outdoors

is given to the plants, the Japanese kinds are usually less satisfactory than the Pompons. These Pompons are a much neglected class since the rise of the large-flowered Japanese kinds, but they are unlike anything else in our garden flora. Their vivid and sometimes too artificial colors harmonize with nothing else at Thanksgiving time, and they are so strong and commanding that they should have a place by themselves. It is not uncommon for the fls. to be in good condition even after several light falls of snow, and they may be considered the most resistant to frost of any garden herbs. In fact, their peculiar merit is blooming after the landscape is completely desolated by successive frosts. The fls. are not ruined until their petals are wet and then frozen stiff. They are essentially for mass effects of color, and great size is not to be expected. Masses of brown and masses of yellow, side by side, make rich combinations. The whole tribe of crimsons, amaranths, pinks, and the like, should be kept by themselves, because their colors are variable and because they make a violent contrast with yellow, which few persons can render agreeable.

The preceding remarks have applied wholly to varieties of *C. Indicum* and *C. morifolium*. The culture of all the other outdoor species is too easy to need any further remarks, except in the case of *C. coccineum*, better known as *Pyrethrum roseum*. In the cultivation of ornamental plants in general, and of hardy, herbaceous plants in particular, few cases are so striking as the great popularity of *Pyrethrum roseum* in the Old World, and the feeble and uncertain hold that it has in America.

W. M.

SECTION IV.—CULTURE OF PYRETHRUM ROSEUM.

This beautiful late spring and early summer flower, so popular and extensively cultivated in gardens abroad, has not yet found much favor here. This fact must be attributed to the general neglect of hardy flowers that prevails in most gardens, as it is an easily grown flower, hardy enough to withstand our winters. As represented to-day in the hundreds of varieties extant, it should command attention. These varieties have everything to recommend them. First and foremost, they are easy to grow. Any good garden soil will suffice for them, but they are rich feeders, and therefore the ground should be deeply dug and liberally enriched with manure. A cool, moist root-run is most conducive to their flowering, and as they are surface-rooting plants (and by consequence liable to suffer soon from hot sun), they are materially assisted by a mulch of manure, or anything that tends to conserve moisture. Propagation is best performed by division in spring. The plants may be lifted, divided into small pieces and potted up separately or planted in a bed of prepared soil in a coldframe, and in a few weeks they will make nice pieces. They can also be rapidly raised in quantity from seed, which, sown in spring, will give plants that will flower the following year. Unless the seed, however, is from very fine varieties, seedlings may result in disappointment; and, in any case, they will not give that richness and variety of form and color as represented in the best named varieties of to-day, which are the result of many years of patient labor and painstaking selection on the part of those who have made Pyrethrums a specialty. Pyrethrums are now obtainable with either single or double flowers, embracing most varied shades of color, from purest white to the richest of crimsons, and even yellow, though for a long time non-existent in Pyrethrums, seems to be an assured possibility. This hue is now possessed by several of the newer acquisitions. To select the best varieties and recommend them is not easy, when the list of one specialist alone contains 400 named varieties, about equally divided between single- and double-flowered kinds, and the best selection of to-day is certain to be superseded less than a decade hence. A few, however, of the very best are: Lord Roseberry, carmine-red; Primrose, pale yellow; Aphrodite, pure white; Alfred Henderson, deep purple; Leonard Kelway, clear rose; Pericles, bright yellow, with guard petals of pale pink; Ne Plus Ultra, white, and very large; Melton, deep crimson; Solfaterre, cream; Princess Beatrice, bright pink; King Oscar, crimson, and Captain Nares, red. These are all double. In singles, a dozen of the best would be: Ascot, peach-pink; Apollyon, bright pink; James Kelway, brilliant red; Oliver Twist, cream; Mary Anderson, flesh-pink; Princess Marie, pure white; Ruth, rose, tipped with white; Stanley, deep carmine-rose; Merry Hampton, dazzling crimson; Ianthe, rose; Ochroleuca, sulphur, and Devonshire Cream, cream color.

A. Herrington.

459. Leaf of Feverfew (*C. Parthenium.*)

Pyrethrum roseum in its numerous varieties possibly may never become as popular in America as in England, owing to the fact that it is not hardy under all soil and exposure conditions in the climate of northern United States. With the proper soil conditions and such attention as may be necessary, it is possible to raise Pyrethrums to the best advantage and with splendid flowering results. The ideal soil for Pyrethrums is a rich, sandy loam that is sufficiently porous to prevent stagnant moisture accumulating about the crowns of the plants. This is the first and principal essential in the culture of Pyrethrums. While they have been grown to comparatively good advantage in soils of a clayey nature, yet unless extreme care is taken to prevent this accumulation of moisture about the crowns, sad havoc is frequently made during severe winters, and especially during unusually abundant rains in the fall. While it is possible to grow Pyrethrums even under the adverse conditions of a retentive clayey soil, yet in such instances, coldframe culture is preferable to depending upon the plant to take care of itself under ordinary conditions. Aside from the danger of winter-killing, there is the danger of crown rot during extremely wet periods in hot weather. In many instances, valuable collections have been quite lost owing to this trouble and the lack of appreciation of the fact that this trouble could be easily remedied by cutting away the rotting foliage nearly to the ground, so as to admit light and air to the center of the crowns to induce fresh and healthy growth. In late autumn, however, this would not be a successful treatment, except in a modified degree. From a commercial point of view, Pyrethrums are among the most difficult of plants to handle through the danger of crown rot, which is the most frequent cause of loss in shipping plants. They are among the most difficult plants to import, and can only successfully stand importation by the utmost care in packing and by shipment of the plants in late fall or very early spring; it is also essential that they should be strong, well-developed clumps in order to withstand the dangers of transportation. A stock of Pyrethrums once established in this country is easily shipped by means of our quick express transportation, if a little care is given to ventilation as well as to packing the plants as dry as possible. The confusion in the names of the varieties offered by American nurserymen is due to the inordinate desire on the part of the European dealers to produce a long list of varieties, many of which are very similar in all outward characteristics. Some of the leading dealers publish a list of from 50 to 100 varieties, and others in still greater number. At the present time, over 400 varieties of Pyrethrums are catalogued, which, while it illustrates the great interest taken in this particular plant in Europe, is evidence that many varieties must be very similar where the range of color extends only from pure white through shades of scarlet to purple, and with only a few varieties that are in any way a satisfactory yellow shade. The yellow-flowered forms at best are hardly deeper than a rich buff or light lemon, and while these shades are distinctly yellow in their effect, still there is no clear golden yellow yet offered in the trade.

J. Woodward Manning.

Hardy Chrysanthemums, sometimes known in old gardens as Artemisias

Alphabetical list of species of Chrysanthemums described below (many of these names are more familiar as Pyrethrums): C. achilleæfolium, 1; anethifolium, 9; *atrosanguineum*, 10; *aureum*, 4; Balsamita, 12; *Burridgeanum*, 5; carinatum, 5; cinerariæfolium, 11; coccineum, 10; coronarium, 7; corymbosum, 2; *Dunnetti*, 5; *fœniculaceum*, 9; frutescens, 8; *hybridum*, 10; Indicum, 19; *Japonicum*, 19; lacustre, 15; *latifolium*, 15; Leucanthemum, 18; maximum, 16; morifolium, 20; multicaule, 14; *parthenifolium*, 4; Parthenium, 3; præaltum, 4; *P. roseum*, 10; C. segetum, 13; *Sinense*, 20; *tricolor*, 5; Tchihatchewii, 6; uliginosum, 17; *venustum*, 5.

A. *Lvs. cut to the midrib or nearly so.*

B. *Fls. borne in corymbs, i.e., flat-topped, dense clusters.*

C. *Rays yellow.*

1. **achilleæfòlium**, DC. (*Achillèa aùrea*, Lam.). Perennial, 2 ft. high: stem usually unbranched, except along the creeping and rooting base: stems and lvs. covered with fine, soft, grayish white hairs, oblong in outline, about 1 in. long, ¼in. wide, finely cut: rays 7–8, short, a little longer than the involucre. Siberia, Caucasus.—Rare in cult. Less popular than the Achilleas with larger flower clusters.

CC. *Rays white.*

D. *Stems grooved, striate, or angled.*

2. **corymbòsum**, Linn. Robust perennial, 1–4 ft. high: stem branched at the apex: lvs. sometimes 6 in. long, 3 in. wide, widest at middle and tapering both ways, cut to the very midrib, the segments alternating along the midrib. Eu., N. Africa, Caucasus. G. C. II. 20:201.—Rare in cult. Segments may be coarsely or finely cut, and lvs. glabrous or villous beneath.

3. **Parthènium**, Bernh. FEVERFEW. Glabrous perennial, 1–3 ft. high: stem usually branched, especially toward the top: flower cluster sometimes very open and loose, especially in cultivation: fls. ¾in. across, whitish: rays twice as long as the involucre: pappus a minute crown. Naturalized from Eu. and escaped from old gardens in Atlantic states.—The single form cult. in old physic gardens, and the full double white form commonly cult. for ornament. Foliage has a strong, bitter odor. The foliage plants commonly advertised under this specific name belong to No. 4.

DD. *Stems not grooved or striated.*

4. **præáltum**, Vent. (*P. parthenifòlium*, Willd.). Perennial, 6 in. high or more: pubescent, or becoming nearly smooth: rays thrice as long as the involucre. Asia Minor, Persia. Var. **aùreum**, Hort. (*P. aùreum*, Hort.), is the GOLDEN FEATHER commonly used for carpet bedding. It has yellow foliage, which becomes green later in the season, especially if flowers are allowed to form. It is used for edgings. Fig. 459. Var. **aùreum crispum**, Hort., is dwarf, compact, with foliage curled like parsley. Var. **selaginoìdes** and var. **laciniàtum**, Hort., are distinct horticultural forms. Var. **glaùcum**, Hort., has dusty white foliage, and does not flower until the second year. Int. by Damman & Co., 1895. All these varieties are prop. by seeds.—This species is considered not distinct from No. 3 by Voss in Vilmorin's Blumengärtnerei.

460. Chrysanthemum Burridgeanum (× ⅓).
A popular strain of the summer-flowering annual, *C. carinatum*.

461. The Marguerite or Paris Daisy.
(*Chrysanthemum frutescens.*)

BB. *Fls. borne singly, on the branches or stems.*

C. *Disk dark purple.*

5. **carinàtum**, Schousb. (*C. trícolor*, And.). Fig. 460. Glabrous annual, 2 ft. high: stem much branched: lvs. rather fleshy: fls. about 2 in. across, with typically white rays and a yellow ring at the base. Summer. These two colors together with the dark purple disk gave rise to the name "tricolor." The typical form introduced into England from Morocco in 1798 was pictured in B.M. 508 (1799). By 1856 signs of doubling appeared (F.S. 11:1099). In 1858 shades of red in the rays appeared in a strain introduced by F. K. Burridge, of Colchester, Eng., and known as *C. Burridgeànum*, Hort. (see B.M. 5095, which shows the ring of red on the rays, adding a fourth color to this remarkably brilliant and varied flower, and F.S. 13:1313, which also shows *C. venùstum*, Hort., in which the rays are entirely red, except the original yellow circle at the base). *C. annulàtum*, Hort., is another name for the kinds with circular bands of red, maroon, or purple (R.H. 1869:450). *C. Dúnnetti*, Hort., is the name of another seed-grower's strain. There are full double forms in yellow, margined red, and white, margined red, the fls. 3 in. across (see R.H. 1874:410). See, also, Gn. 26, p. 440; 10, p. 213, and 21:319. R.H. 1874, p. 412. S.H. 2:477.—The commonest and gaudiest of annual Chrysanthemums, easily distinguished by the keeled or ridged scales of involucre and the dark purple disk. "Carinatum" means "keeled."

CC. *Disk yellow.*

D. *Height less than 1 ft.*

6. **Tchihàtchewii**, Hort. TURFING DAISY. Densely tufted plant for carpeting dry, waste places. Height 2–9

in.: stems numerous, rooting at the base: foliage dark green, finely cut: fls. borne profusely for several weeks in midsummer: rays white. Siberia or Asia Minor? R.H. 1869, p. 380 and 1897, p. 470. Gn. 26, p. 443.—Prop. by division of roots or simply by cutting the rooted stems, but chiefly by seeds. This has never been fully described, and it is possible that the lvs. may not be cut to the midrib or near it.

DD. *Height more than 1 ft.*

E. *Plants annual.*

7. **coronàrium**, Linn. (*Anthemis coronària*, Hort.). Height 3–4 ft.: lvs. bipinnately parted, somewhat clasping or eared at the base, glabrous, the segments closer together than in *C. carinatum:* involucral scales broad, scarious: rays lemon colored or nearly white. July–Sept. Mediterranean. Gn. 26:467. G.C. II. 19:541.—The full double forms, with rays reflexed and imbricated, are more popular than the single forms. This and *C. carinatum* are the common "summer Chrysanthemums." This is common in old gardens, and is also slightly used for bedding and for pot culture.

EE. *Plants perennial.*

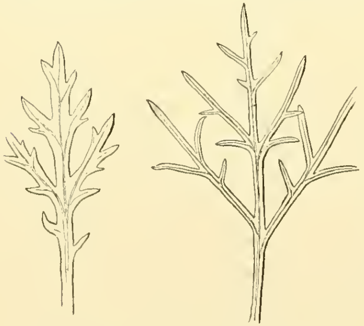
F. *Greenhouse plants, shrubby at the base: stems branched at the top: rays white or lemon.*

G. *Foliage not glaucous.*

8. **frutéscens**, Linn. Marguerite. Paris Daisy. Fig. 461. Usually glabrous, 3 ft. high: lvs. fleshy, green: fls. numerous, always single: rays typically white, with a lemon-colored (never pure yellow or golden) form. Canaries. G.C. II. 13:561. Gn. 12, p. 255; 17, p. 5, and 26, p. 445.—Int. into Eng. 1699. This is the popular florists' Marguerite, which can be had in flower the year round, but is especially grown for winter bloom. Var. **grandiflòrum**, Hort., is the large-fld. prevailing form. The lemon-colored form seems to have originated about 1880. Under this name an entirely distinct species has also been passing for about a century, yet it has never been advertised separately in the Amer. trade. See No. 9.

GG. *Foliage glaucous.*

9. **anethifòlium**, Brouss. (*C. fœniculàceum*, Steud. *P. fœniculàceum*, var. *bipinnatifidum*, DC.). Glaucous Marguerite. Fig. 462. Rarer in cult. than No. 8 (which see), but distinguished by its glaucous hue and by the way in which the lvs. are cut. The segments of No. 9 are narrower, more deeply cut, and more distant. The lvs. are shorter petioled. Canaries.—The dried specimen in the Garden Herbarium of Cornell University Experiment Station from a plant long cultivated in Sage conservatories was identified by L. H. B. with the picture in Andrews' Botanical Register 272, published early in the century, since when the plant has almost never been mentioned in garden literature. This species is doubtless cult. in Amer. greenhouses as *C. frutescens*. A lemon-fld. form is shown in R. H. 1845:61 but erroneously called *C. frutescens*.



462. Leaves of common and glaucous Marguerites (*Chrysanthemum frutescens* and *anethifolium*).
Showing the difference. Glaucous kind on the right.

FF. *Hardy herbs: stems usually unbranched: rays white or red, never yellow.*

G. *Foliage not glaucous: fls. sometimes double.*

10. **coccíneum**, Willd. (*Pyrèthrum ròseum*, Bieb. *P. hýbridum*, Hort.). Fig. 463. Glabrous, 1–2 ft. high: stem usually unbranched, rarely branched at the top: lvs. thin, dark green, or in dried specimens dark brown: involucral scales with a brown margin: rays white or red in such shades as pink, carmine, rose, lilac, and crimson, and sometimes tipped yellow, but never wholly yellow. Caucasus, Persia. F.S. 9:917. Gn. 26, pp. 440, 443. Gng. 2:7 and 5:309. R.H. 1897, p. 521. Not B.M. 1080, which is *C. coronopifolium*. The first picture of a full double form is R.H. 1864:71.—This species is the most important and variable of all the hardy herbaceous kinds. There have been perhaps 600 named horticultural varieties. There is an anemone-fld. form with a high disk. The species is also cult. in Calif. and France for insect powder. *C. atrosanguíneum*, Hort., is said to be a good horticultural variety with dark crimson fls.

463. Chrysanthemum coccineum.
The familiar *Pyrethrum roseum* of the gardens.

464. Costmary or Mint Geranium—Chrysanthemum Balsamita, var. tanacetoides.

GG. *Foliage glaucous: fls. never double.*

11. **cinerariæfòlium**, Vis. Glaucous, slender, 12–15 in. high: stems unbranched, with a few short, scattered hairs below the fl.: lvs. long-petioled, silky beneath, with distant segments: involucral scales scarious and whitish at the apex. Dalmatia. B.M. 6781.—The chief source of Dalmatian insect powder. Rarely cult. as a border plant. Common in botanic gardens.

AA. *Lvs. not cut to the midrib: the primary incisions shallow.*

B. *Fls. borne in flat-topped clusters.*

12. **Balsámita,** Willd. (*Tanacètum Balsámita,* Linn.). Tall and stout: lvs. sweet-scented, oval or oblong, obtuse, margined with blunt or sharp teeth, lower ones petioled, upper ones almost sessile, the largest lvs. 5–11 in. long, 1½–2 in. wide. W. Asia.—Typically with short white rays, but when they are absent the plant is var. **tanacetoides,** Boiss. COSTMARY. MINT GERANIUM. Fig. 464. Also erroneously known as lavender. This has escaped in a few places from old gardens.

465. Chrysanthemum lacustre.

BB. *Fls. borne singly on the branches or stems.*

C. *Plants annual: foliage glaucous: rays golden yellow.*

13. **segètum,** Linn. CORN MARIGOLD. Annual, 1–1½ft. high: lvs. sparse, clasping, very variable, incisions coarse or fine, deep or shallow, but usually only coarsely serrate, with few and distant teeth. June–Aug. Eu., N. Afr., W. Asia. Gn. 18, p. 195. R.H. 1895, pp. 448, 449.—Var. **grandiflòrum,** Hort., is a larger-fld. form of this weed, which is common in the English grain fields. The var. Cloth of Gold, J.H. III. 12:445, is probably the best. This species is much less popular than *P. carinatum* and *coronarium.* It is also forced to a slight extent for winter bloom. "Segetum" means "of the corn fields."

14. **multicaùle,** Desf. Glabrous and glaucous annual, 6–12 in. high: stems numerous, simple or branched, stout, terete: lvs. fleshy, variable, usually linear-spatulate, 1–3 in. long and ½–¾ in. broad, very coarsely toothed or lobed, sometimes shorter, with few narrow-linear, acute, entire segments about 1 line broad: rays much shorter and rounder than in No. 13. Algeria. B.M. 6930.—Rarer in cult. than No. 13. Said to be useless as a cut-flower.

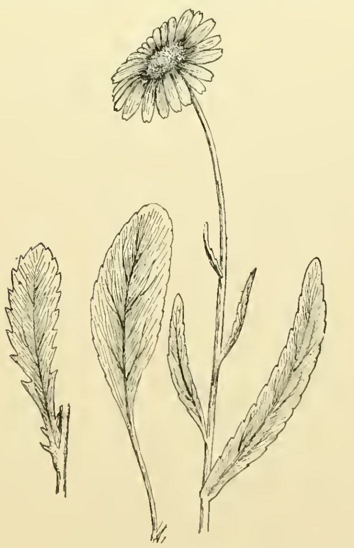
CC. *Plants perennial: foliage not glaucous (except in wild forms of No. 20).*

D. *Rays always white: fls. never double: practically never cult. under glass.*

15. **lacústre,** Brot. (*C. latifòlium,* DC.). Fig. 465. This is endlessly confused with *C. maximum* in gardens, and the two species are very variable and difficult to distinguish. The fls. cannot be told apart. *C. lacustre* is a taller and much more vigorous plant, and sometimes it is branched at the top, bearing 3 fls., while *C. maximum* is always 1-fld. Height 3–6 ft.: stem sparsely branched: lvs. partly clasping, ovate-lanceolate, with coarse, hard teeth: fls. not distinguishable from No. 16: rays about 1 in. long; pappus of the ray 2–3-eared. Portugal, along rivers, swamps and lakes. R.H. 1857, p. 456.—According to R. Irwin Lynch, in Gn. 26, p. 441, *C. lacustre* has coriaceous, oval lvs. about 3 times as long as broad, while in *C. maximum* the lvs. are 5 times as long as broad. H. Cannell, Swanley, Eng., says that *C. lacustre* is 2 ft. high and blooms 3 weeks before *C. maximum.* With Woolson, Passaic, N. J., it grows 4–5 ft. high. The rays in Fig. 465 are rather shorter than usual.

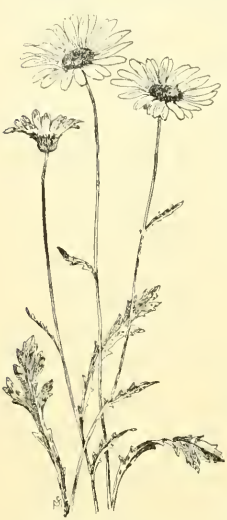
16. **máximum,** Ramond. Fig. 466. This species has narrower lvs. than No. 15, and they are narrowed at the base. Height 1 ft.: stem more angled than the above, simple or branched at the very base, always 1-fld. and leafless for 3–4 in. below the fl.: lower lvs. petioled, wedge-shaped at the base, lanceolate, dentate from the middle to the apex; stem-lvs. sessile, wide- or narrow-lanceolate, typically serrate throughout their whole length, but variable, as in Fig. 466: pappus none: involucral scales narrower and longer, whitish-transparent at the margin, while those of *C. lacustre* are broader, more rounded at the apex, and with a light brown, scarious margin. Pyrenees.—For other pictures of these two species, see J.H. III. 5:25, and Gn. 26, p. 437. Var. **filifórmis,** Hort., "with long, narrow, thread-like petals." Int. 1899. Var. **Triumph** has "fls. 4 in. across, with broad, overlapping petals."

17. **uliginòsum,** Pers. (*P. uliginòsum,* Waldst.). GIANT DAISY. Stout, erect bush, 4–5 ft. high, with light green foliage: stem nearly glabrous, striate, branching above, rather deeply serrate, roughish: fls. 2–3 in. across. Hungary. B.M. 2706. A.F. 4: 523 and 8: 813. Gng. 2: 375 and 5: 183. A.G. 19: 403. R.H. 1894, p. 82. Gt. 46, p. 103. G. C. II. 10: 493. Gn. 26, p. 442 and 38, p. 523.—Next to *C. coccineum,* this is the most popular of the hardy herbaceous kinds. In A. F. 4: 465 Wm. Falconer shows a 2-year-old plant 6 ft. high, 17 ft. in circumference at a point 4 ft. from the ground, and carrying thousands of flowers. It blooms the first year from seed or division, and has been forced for Easter somewhat as *Hydrangea paniculata* can be treated. Excellent for cut-fls. The blossoms should be cut soon after opening, as the disks darken with age. The plant needs a rich, moist soil, and deserves a greater popularity. "Uliginosum" means "inhabiting swampy places."



466. Chrysanthemum maximum.

18. **Leucánthemum**, Linn. OX-EYE DAISY. WHITEWEED. Fig. 467. Glabrous weed, 1-2 ft. high: root-lvs. long-petioled, with a large, oval blade and coarse, rounded notches; stem-lvs. lanceolate, becoming narrower toward the top, serrate, with few distant and sharper teeth. June, July. Eu., N. Asia.—One of the commonest weeds in the eastern states, being the characteristic plant of New England's wornout meadows. The daisies are never cultivated, but they are often gathered for decoration, and make excellent cut-flowers. See, also, *Daisy*.



467. Ox-eye Daisy, or Whiteweed.
(*Chrysanthemum Leucanthemum.*)

DD. *Rays many-colored: fls. often double: the common "Chrysanthemums" of the florists.*

19. **Índicum**, Linn. (*C. Japónicum*, Thunb.). The wild plants native to China and Japan are dwarfer than *C. morifolium*, with lvs. thinner, more sharply cut, and green on both sides, not glaucous: involucral scales with wider and more scarious margins: no chaff: fls. smaller, numerous, and with rays always yellow and short, not much longer than the involucre. For pictures of wild plants, see G. C. III. 8:565 and G. M. 33:729.—Neither this species nor the next grows wild in India, and the name given by Linnæus was inappropriate. This species has varied greatly in cultivation, and its progeny has been hybridized with that of *C. morifolium*. Neither species in its pure form is in cultivation. Unfortunately, it is not possible to definitely trace the origin of any of the main horticultural types, races or sections. See historical sketch above. *C. Indicum* is often used in Germany in a wide sense, including *C. Sinense*.

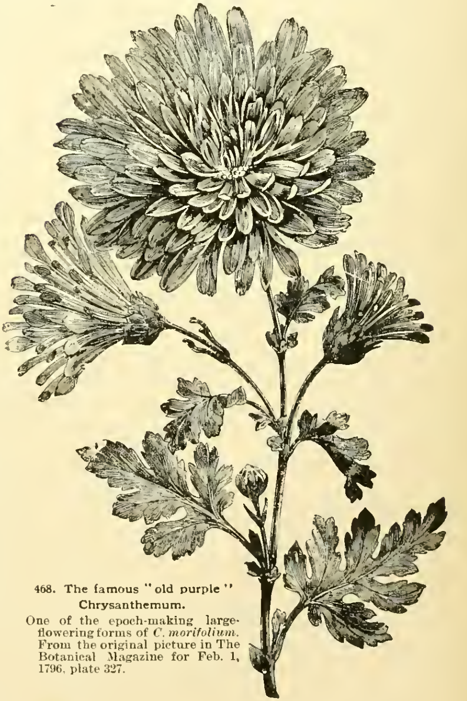
20. **morifolium**, Ramatuelle (*C. Sinénse*, Sabine). The wild plants in Japan and China are more robust than *C. Indicum*, 2-4 ft. high, more or less tomentose, with very variable lvs., which are usually ovate in outline, sinuately cut and lobed, thick, firm, leathery, long-petioled, and glaucous beneath: fls. larger and fewer, with rays never (?) yellow; involucral scales with narrower scarious margins: chaff present on the disk.—This species was founded upon a cultivated and double form, and there have been different opinions as to the original wild progenitor. The above definition is an enlargement of Hemsley's, in G.C. III. 6:522. B.M. 327 (erroneously named *C. Indicum*). Fig. 468 is the original double purple-flowered, partly quilled variety, on which Ramatuelle, in 1792, founded the species *C. morifolium*.

C. inodòrum, Linn.=Matricaria inodora. W. M.

CHRYSOBÁCTRON (*golden wand*, from the Greek). *Liliàceæ*. Two New Zealand bulbs, bearing many small yellow fls. in a long raceme on the top of an elongated scape. Plant often diœcious. Very closely allied to Anthericum, with which Baker unites it, whereas Bentham & Hooker refer it to Bulbinella. **C. Hoòkeri**, Colenso, is in cult. in this country. It is a hardy plant 2-3 ft. high, with sword-like foliage. B.M. 4602.—Cult. in the ordinary border, and treated like the Asphodel, they do well, but are vastly improved in rich, deep and rather moist soil. Strong clumps, 4-6 years old, are then at their best and are very excellent plants. After that they should be divided. Prop. by division or seed. Blooms in June and July. J. B. KELLER and L. H. B.

CHRYSOBÁLANUS (*golden acorn*, from the Greek, referring to the fruit). *Rosàceæ*. Two species in the warm parts of Amer. and Afr. The COCOA PLUM, **C. Icàco**, Linn., grows on coasts and along streams in S. Fla., in south to S. Amer., and also in Afr. It is sometimes planted in the extreme south (and in the tropics) as an ornamental shrub and for its sweetish but insipid and dry plum-shaped fruits. The Cocoa Plum is a mere bush on the northern limits of its distribution, but in extreme S. Fla. it reaches a height of 25-30 ft. It has glossy, thick obovate (sometimes obcordate) lvs.: fls. small and white, in axillary, erect racemes or cymes; calyx 5-cleft, pubescent; petals 5; stamens about 20: fr. 1-seeded, often 1 in. in diam., varying from nearly white to almost black. It is best propagated by seeds, but may also be had from cuttings of half-ripened wood. L. H. B.

CHRYSOCÒMA. See *Linosyris*, for the only species in the American trade.

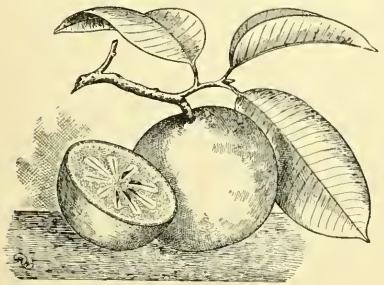


468. The famous "old purple" Chrysanthemum.
One of the epoch-making large-flowering forms of *C. morifolium*. From the original picture in The Botanical Magazine for Feb. 1, 1796, plate 327.

CHRYSÒDIUM. See *Acrostichum*.

CHRYSÓGONUM (Greek-made name, *golden knee* or *joint*). *Compósitæ*. **C. Virginiànum**, Linn., is a perennial yellow-fld. plant of S. Penn. and south, which is sometimes cult. as a border plant. It blooms in spring or early summer on stems which become 1 ft. high, the heads being solitary and peduncled in the axils. Lvs. ovate and mostly obtuse, crenate. Prop. by creeping rootstocks and runners. Of little merit horticulturally.

CHRYSOPHÝLLUM (Greek, *golden leaf*, in reference to the color of the under surface of the handsome leaves). *Sapotàceæ.* Many species of trees, with milky juice, widely distributed in the tropics. Fls. small, solitary at the nodes or in fascicles; calyx mostly 5-parted; corolla tubular-campanulate, usually 5-lobed or -parted; stamens 5, standing on the corolla tube: fr. usually fleshy, sometimes edible. **C. Cainito**, Linn., is the STAR APPLE, Fig. 469. The fruit is the size of an apple, symmetrically globular and smooth. A cross-section shows the star-shaped core, whence the common name. It varies from white to purple in color of skin and also of flesh. The pulp is delicious (used uncooked) if the fruit is allowed to remain on the tree until ripe. It has large, pumpkin-like seeds. The tree reaches a height of 25 to 30 ft. It is very impatient of frost. It is native to the W. Indies. I.H. 32:567. A.G. 11:405. **C. oliviforme**, Lam., is also in the Amer. trade, but as an ornamental plant. It is a smaller West Indian tree, native also in extreme S. Fla. Lvs. like those of the last: stigma 5-crenate (in *C. Cainito* 8–10-crenate): fr. ovoid-oblong and small, 1-seeded, blackish, insipid. These plants are allied to the Sapodillo.



469. Chrysophyllum Cainito (× ⅓).

The various species of Chrysophyllum have beautiful broad green leaves, with under surfaces of a silky texture, varying in color from a silvery white, through golden, to a russet brown, and are well worth a place in the conservatory as ornamental trees. By giving them sufficient room, they will bear fruit in the course of a few years, under glass, which in the case of *C. Cainito*, the Star Apple of the West Indies, is edible, and well liked even by people of a temperate clime. All species are strictly tropical, and cannot be grown where frosts occur unless properly protected. Propagation is ordinarily effected by seeds, which readily germinate if planted when fresh, and it is stated that all species may be grown from cuttings of well-ripened shoots placed in strong, moist heat. The soil most suited for their growth is of a sandy character, and if not of a good quality should be well manured, using a considerable proportion of potash in the fertilizer for fruiting specimens. They seem to do well on a great variety of soils, however, that are sufficiently well drained, wet land not agreeing with them.

E. N. REASONER and L. H. B.

CHRYSOPÒGON (*golden beard*). *Gramineæ.* Very like Andropogon, with which some authors unite it: differs in having spikelets in pairs (or sometimes in 3's), the lateral ones stalked and sterile or often reduced to mere pedicels, only the middle or terminal one fertile. **C. nùtans**, Benth. (*Andropògon avenàceus*, Michx.), is in the trade. It is native on dry soils in the eastern U. S., growing 2–5 ft. high: perennial: culm unbranched, terete: lvs. glaucous and narrow, short: panicle narrow, with nodding, shining yellowish spikelets. Useful for the wild border.

L. H. B.

CHRYSÓPSIS (*golden appearance*, from the heads). *Compósitæ.* Allied to Solidago and Erigeron; N. American. Heads of medium size and many-fld., usually with numerous yellow rays; involucre bell-shaped or hemispherical, of imbricated bracts: akenes compressed, bearing a pappus of numerous hair-like bristles. **C. villòsa**, Nutt., is the only species in the trade. It is widely distributed from Ill. W., N. and S.: 1–2 ft., grayish pubescent: lvs. oblong to lanceolate, entire or few-toothed: heads usually at the ends of leafy branches, aster-like in shape. Extremely variable, and has several named forms. Mn. 7:101. Var. **Rùtteri**, Rothr., is larger and later. Of value as a border plant. Cult. the same as Aster. Perennials, but bloom the first year from seed, if sown early.

L. H. B.

CHRYSOSPLÈNIUM AMERICÀNUM, Schw. (name from *golden* and *spleen*, referring to some old medicinal tradition). *Saxifragàceæ.* A native plant creeping in mud, which is sold for bog-planting. Stems forking, bearing roundish or cordate small mostly opposite lvs., with very small, nearly sessile, greenish, inconspicuous fls. Scarcely known in cult.

CHRYSÙRUS CYNOSUROÌDES. See *Lamarckia.*

CHUFA. The edible subterranean tubers of *Cyperus esculentus*, Linn., much prized in the S. They are eaten raw or baked, or used for the making of coffee. The plant is sometimes cult. in the N., but it will not withstand the winter. The tubers are oblong, ½–¾ in. long, cylindrical, hard. The plant is grass-like, and in the N. does not flower. Nuts are planted in the spring, and the new crop is ready for digging in the fall.

CHÝSIS (Greek for *melting*, alluding to the pollen masses). *Orchidàceæ*, tribe *Vándeæ.* A genus of orchids found in Trop. Amer., pendulous from trees. Pseudobulbs usually spindle-shaped, attenuate toward the base, leafy upwards: lvs. broadly-lanceolate, plicate, conspicuously nerved, bases sheathing: fls. fleshy, few to many, in lateral racemes from the young growths; lateral sepals adnate to base of column; labellum 3-lobed, with 5 whitish callosities near the base. The species bloom in spring and early summer. Handsome orchids, requiring tropical treatment; not largely grown in American collections. Remove to a lower or intermediate temperature when resting. Grown in pots or baskets, in peat and moss.

aùrea, Lindl. About 1 ft. high: lvs. about 5, 10–15 in. long: fls. 2 in. in diam.; petals and sepals oval-oblong, reddish yellow, pale yellow at the base: lateral lobes of labellum incurved, midlobe roundish, spotted with red and yellow. S. Amer. B.M. 3617.—There is a var. **maculàta.**

bractéscens, Lindl. Sepals and petals cuneate-oblong, concave; labellum white outside, yellow, streaked and stained with red inside: fls. 3 in. in diam. From Mex., found at an altitude of 1,500 ft. B.M. 5186. R.H. 1859, pp. 294, 295. I.H. 27:398. J.H. III. 28:263.—One of the most showy orchids.

læ̀vis, Lindl. More robust than the preceding: lvs. shorter than the pseudobulbs: racemes 9–10-fld., from among sheathing scales of new growth; fls. 2½ in. in diam.; sepals bright yellow, upper one linear-oblong, lateral ones acuminate, about 1 in. long; petals yellow, falcate; labellum yellow with streaks and dots of orange. Mex., 1840.

Limminghei, Lind. & Reichb. f. Stems short: racemes about 5-fld.; sepals and petals oblong-lanceolate, blush-white tipped with rosy mauve; lateral lobes of labellum obtuse, yellow streaked with crimson, midlobe large, pink-lilac striped with rose-mauve. From Mex., near the sea-coast. B.M. 5265.

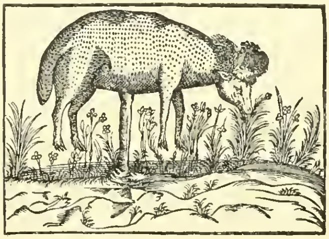
Chélsoni, Hort. (*C. bractescens* × *C. lævis*). Pseudobulbs narrow: raceme 6 in. long and curved, with 5–6 yellow and purple-blotched fls.

Sèdeni, Hort. (*C. Limminghei* × *C. bractescens*). Fls. much like those of *C. bractescens* but smaller, white, petals with mauve streaks; lip more like that of *C. Limminghei*, yellow or whitish.

OAKES AMES.

CIBÒTIUM (Greek, *a little seed-vessel*). *Cyatheàceæ.* A small genus of tree-ferns from Mexico and Polynesia, with copious, bivalved, coriaceous indusia, differing from Dicksonia in having the outer valve entirely distinct from the leaf. For culture, see *Dicksonia.*

C. Barometz is the plant that gave rise to the wonderful stories of the Barometz or Scythian Lamb (Fig. 470), which, according to Bauhin, 1650, had wool, flesh and blood, and a root attached to the navel. The plant was said to resemble a lamb in every respect, but grew on a stalk about a yard high, and turning about and bending to the herbage, consumed the foliage within reach, and then pined away with the failure of the food until it died. Wolves sought it and ate it as if it were a true lamb. In 1725 Breyne, of Dantzig, declared that the Barometz was only the root of a large fern, covered with its natural yellow down and accompanied by stems, which had been placed in museums in an inverted position, the better to represent the appearance of the legs and horns of a quadruped. A.G. 12:258.



470. The Scythian Lamb. See *Cibotium Barometz.*

A. *Outer valve of the indusium larger, or the valves subequal.*

glaùcum, Hook. & Arn. Lvs. ovate-lanceolate, tripinnate; pinnules about 6 in. long, taper-pointed; segments close: outer valve of indusium larger, broader than the inner: veins once- or twice-forked. Hawaiian Islands.

Bárometz, J. Sm. Scythian Lamb. Trunkless: lvs. scented, tripinnate, the lower pinnæ ovate-lanceolate; pinnules short-stalked, 4–6 in. long, with falcate segments: valves of the indusium nearly equal: veins prominent, rarely forked. China.

AA. *Outer valve of the indusium smaller than the inner.*

Schièdei, Hook. Caudex 10–15 ft. high: lvs. oblong-deltoid, tripinnate, with pinnæ 1–2 ft. long; segments falcate, sharp-pointed: sori sparse: veins forked, on the lowest pinnate. Mexico.

regàle, Linden. Caudex 10–12 ft. high: lvs. oblong-deltoid, tripinnate, with pinnæ 18–24 in. long; pinnules sessile, with close, falcate, deeply incised segments: veins pinnate in the lobes. Mex.

L. M. Underwood.

CIBOULE. Consult *Onion.*

CÌCCA. Now combined with *Phyllanthus.*

CÌCER (old Latin name for the Vetch). *Leguminòsæ.* Pea-like plants, with 5-parted calyx, oblong turgid 2-seeded pod, mostly 1-fld. peduncles, odd-pinnate lvs. and toothed leaflets. Small genus, with a Mediterranean-Asian range. **C. arietìnum,** Linn., the Chick-Pea, is sometimes cult. in vegetable gardens for the edible ripe seeds. It is an annual and is cult. the same as bush beans. Withstands dry weather well. It grows 2 ft. high, making a bushy, hairy plant. Lvs. with small, roundish leaflets: fls. white or reddish, small, axillary. Seed roundish, but flattened on the sides, with a projection on one side. Little known in Amer., but much cult. in S. Eu. and Asia.

L. H. B.

CICHÒRIUM (Arabic name). *Compósitæ.* A very few Old World herbs, with ligulate corollas, double-rowed scales to the involucre, angled akenes, bristly or chaffy pappus, and blue fls. Two species are of interest to the horticulturist, *C. Intybus,* Linn. (Fig. 436), the Chicory, and *C. Endivia,* Linn., the Endive. See those entries for fuller information.

CIENKÒWSKIA. See *Kæmpferia.*

CIMICÍFUGA, Linn. (*cimex,* a bug; *fugere,* to drive away). *Ranunculàceæ.* Bugbane. Allied to *Actæa.* Tall, hardy, herbaceous perennials, ornamental, but bad-smelling, suited for the back of borders or for partially shaded places in the wild garden. About 10 species, natives of the north temperate zone. Lvs. large, decompound: fls. white, in racemes; sepals 2–5, petaloid, deciduous; petals 1–8, small, clawed, 2-lobed or none: follicles 1–8, many-seeded, sessile or stalked; stigma broad or minute. Half shady or open places; any good garden soil. Prop. by seeds and division of roots in fall or early spring.

Americàna, Michx. (*Actæa prodocárpa,* DC.). Slender, 2–4 ft. high: lvs. pale beneath: fls. in elongated raceme; petals 2-horned; pedicels nearly as long as the fl.: follicles 3 or 5, stalked: seeds in 1 row, chaffy: stamens and pistils usually in same fl. Aug.–Sept. Moist woods of Alleghanies.

fœ́tida, Linn. Lvs. bipinnate, terminal lft. 3-lobed: petals of the white fls. often tipped with anthers; no staminodia: follicles 3–5; seeds very chaffy. Summer. Siberia.—Following var. only is cult.

Var. **simplex,** Reg. (*C. símplex,* Wormsk.). Tall and handsome: fls. short-pedicelled, forming a fine, dense raceme, and at first pubescent: follicles short-stalked. Kamtschatka.

racemòsa, Nutt. (*C. serpentària,* Pursh). Fig. 471. Stem 3–8 ft. high: lvs. 2–3 times 3–4-parted; lfts. mostly ovate, firm texture: racemes few, rigidly erect, often becoming 2 ft. long: follicles rather shorter than the pedicel, nearly ¼ in. long, short style abruptly recurved. Very pretty in fr., with its two rows of oval follicles always extending upward from the lateral branches. July–Aug. Georgia to Canada and westward. Int. 1891. Gt. 13:443. Gn. 46, p. 269. G.C. II. 10:557. D. 79.—The commonest in gardens.

Var. **dissécta,** Gray (*C. spicàta,* Hort.). Lvs. more compound than the type: small white fls. closely packed on lateral and terminal branches. Lasting until Sept. Del. and S. Penn. J.H. III. 33:381.

C. cordifòlia, Pursh. Lvs. very broadly ovate or orbicular. B.M. 2069.—*C. elàta,* Nutt. (C. fœtida, Pursh. Actæa Cimicifuga, Linn.). Used in medicine. Reg. Veg. Med. 1:37.—*C. Japónica,* Spreng. Three ft. high: lvs. very large. F.S. 22:2363 (as Pithyrosperma acerinum).—*C. palmàta,* Michx. = Trautvetteria Carolinensis, Vail.

K. C. Davis.

CINCHÒNA (from Countess Chinchon). *Rubiàceæ.* This genus of plants contains, according to Index Kewensis, 67 species, some of which yield bark containing quinine. The species grow isolated in various districts of the Andes, at elevations ranging from 2,300 to 9,000 ft., and between 22° S. and 10° N. latitude. Some of the species are lofty trees, others are mere shrubs. The lvs. are opposite, with deciduous stipules. The fls. are fragrant, much frequented by humming birds, white and pink in color, growing in terminal panicles. The calyx is small, 5-toothed, and persistent. The corolla has a long tube with 5 short, spreading, valvate lobes, hairy at the margins. The stamens are 5, included in the corolla. The ovary is 2-celled, with very numerous ovules inserted on linear axile placentæ. The capsule opens septicidally from the base upwards. The seeds are small, numerous, flat and surrounded with a wing.

Commercial Cinchona bark is known under the following names: "Crown," "Loxa," or "Pale bark," yielded by *Cinchona officinalis* and its varieties *Condaminea, Uritusinga, crispa;* "Red bark," from *C. succirubra;* "Hybrid bark," from hybrids of *C. officinalis* and *C. succirubra;* "Royal," or "Yellow bark," from *C. Calisaya* and its varieties *Ledgeriana* and *verde*; "Carthagena bark," from *C. lancifolia*; "Columbian bark," from *C. cordifolia* and *C. lancifolia*; "Gray bark," from *C. micrantha*, *C. nitida* and *C. Peruviana*.

Certain alkaloids, namely, quinine, quinidine, cinchonine and cinchonidine, occur in these barks in varying quantities in different species. These alkaloids possess powerful antiperiodic, tonic and antiseptic properties. In the barks there are also quinovic and other acids, and other substances possessing astringent properties which render them useful in certain cases, where the alkaloids have failed to give relief.

The bark was introduced into Europe in 1640, by the Countess of Chinchon, wife of the Viceroy of Peru; hence it was called Countess' powder and Peruvian bark, and also Jesuits' bark, from the knowledge of it spread by that religious order. The word quinine is derived from the name by which it was known in Peru, *quinaquina*, or "bark of barks."

Dr. Ainslie, at the end of the eighteenth century, and Dr. Forbes Royle, in his work on Himalayan botany in 1839, advocated the introduction of the trees into India. At length, in 1859, Clements Markham was entrusted by the government of India with the task of collecting plants and seeds on the Andes, and establishing them in India. In his book "Peruvian Bark: a popular account of the introduction of Cinchona cultivation into British India," Markham recounts the difficulties in S. Amer. and his final success. The object of the government was to put it within the power of the poorest native to purchase a dose, and this aim has been accomplished. At any post office in India, a 5-grain dose may be bought for three pice (1½ farthings). The government not only uses bark from its own plantations, but buys bark from Cinchona planters at a good price, and is now extending its own cultivation with seed procured from Jamaica. In Ceylon the cultivation was altogether in private hands, and has been abandoned for tea. In Java, the Dutch have been most successful, as the variety *Ledgeriana*, which is very rich in quinine, is particularly well suited to the climate. In Jamaica, the government plantations had realized by sales from 1880 to 1887, £17,000 (about $85,000), and then the price of bark fell considerably and no more has since been exported. *C. officinalis* has become thoroughly naturalized, and is reproducing itself, as if it were in its native home.

471. Cimicifuga racemosa.

Culture.—The seedlings may be raised either in boxes or in beds. The boxes should not be more than 3 or 4 in. deep. Three-quarter-inch drainage holes should be made in the bottom, about 6 in. apart. Whitewash the boxes or dust them inside with lime. Put pieces of broken flower-pots over the drainage holes, and cover the bottom with gravel to a depth of 1 in. The soil should be made up of one-third leaf-mold, one-third good soil and one-third fine river gravel. These should be thoroughly mixed and passed through a quarter-inch sieve. Fill the boxes to within one-quarter of an inch of the top, and slightly water. Sow the seed evenly, and sprinkle over it some of the sifted soil, only just covering it. The boxes should be under shade, sheltered from rain, and watered every day with a very fine spray from a watering can. The seedlings will appear above the ground in 3 or 4 weeks. If the seeds are sown in beds, they require the protection of a roof sloping south, and supported by posts 4 ft. 6 in. high on the north, and 3 ft. 3 in. on the south side. The sides may also have to be covered in. The breadth of the beds is 3 ft., and these should be made up of soil as for the boxes. The roof projects beyond the south posts sufficiently to keep off direct sunlight, and in the summer time, at any rate, a narrow north roof must be added at right angles. If the sheds are built under the shade of tall trees that keep off direct sunlight, the roof is only needed for shelter from rain, and can be constructed solely for that purpose. The shed may run as far as convenient east and west, and others may be added 2½–3 ft. on either side.

When the seedlings are 1½–2 in. high, they should be transplanted into nursery beds, made up in the same way as for seeds. In transplanting, use a wooden peg 4 or 5 in. long, ¾ in. thick at one end and tapering to a dull point. A seedling is picked up with the left hand from a bundle brought from the seed-beds, a hole is made with the peg in the right hand, big enough to receive the roots without bending or crushing them. The soil is then pressed closely over the rootlets with the peg. Two inches between each plant is enough room. At first the plants should be shaded, but when they are twice or thrice as high as when transplanted, the shading may be gradually removed to harden them for putting out in their permanent positions.

The soil and subsoil should be free and open to insure good drainage; newly cleared forest land on a hillside is the best for Cinchona trees. In Jamaica, *Cinchona officinalis* flourishes best at an elevation of about 5,500 ft., with a mean annual temperature of about 60° F., ranging from a minimum of 46° to a maximum of 75°, and with a total annual rainfall of 120 to 150 inches.

The distance when planted out in their permanent positions is 3 ft. by 3, and as soon as they begin to interfere with each other's growth, they should be thinned out just sufficiently at first to prevent this. The bark of those cut down may be worth stripping if the price of bark is high.

In taking the bark from the trees, there are several methods that have been used. In S. Amer. the tree is uprooted, and the whole of the bark may be taken from both root and stem. A second plan is used if shoots spring from the root; the trunk is cut through above the ground, the bark stripped, and the stump left to coppice, one or two of the shoots being allowed to grow. The third method is to make the same tree yield bark in successive seasons; for this purpose longitudinal layers of the bark are removed from the trunk, and the exposed surface is sometimes covered with moss; the bark renews itself, and the "renewed bark" is as rich or richer in alkaloids than the original. In this way, by taking successive strips of bark in different years, the tree yields a continuous supply of bark.

Wm. Fawcett.

Cinchonas are sometimes seen in collections of economic plants, but only one of them seems to be regularly in the trade at this time. This is *C. officinalis*, var. *Condaminea*, which Franceschi says is "probably the least delicate and most easily grown of all Cinchonas."

L. H. B.

CINERÀRIA (*ash-colored*, from the Latin, referring to the gray foliage). *Compósitæ*. Herbs or under-shrubs, closely allied to Senecio, from which they are separated chiefly by technical characters of the akene. The genus is variously understood by different authors. As limited by Bentham & Hooker, it comprises about 25 South African species, and the common garden Cineraria becomes a Senecio. The Cineraria of the florists (Fig. 472) is now much modified by cultivation. There are two views of its origin, one holding that it is a direct development of *C. cruenta*, Mass., the other that it is a hybrid, into which *C. cruenta*, *C. Heritieri*, *C. populifolia*, and perhaps others, have probably blended. These are all natives of the Canary Islands. The writer is inclined to believe that it is a direct evolution from *C. cruenta*. This species is figured in B. M. 406. For the more important literature of the recent discussion respecting the origin of the garden Cineraria, see Nature, 51:461, 605; 52:3, 29, 54, 78, 103, 128; 55:341. G.C. III. 3:654 and 657; 17:588, 655, 742; 18:89, 186.

See ***Senecio*** for *Cineraria acanthifolia*, *C. candidissima*, and *C. maritima*. To the garden or florist's Cineraria (*C. cruenta*) belong the horticultural names *C. hybrida*, *C. grandiflora*, *C. Kewensis*, *C. nana*, and the like. There are full-double forms (see R. H. 1874, p. 47; 1886, p. 41. F.S. 22:2347–8. I.H. 32:556). L. H. B.

The single hybrid Cinerarias are among the most useful and beautiful of all greenhouse flowering plants. The ease with which they can be raised, the little heat required, together with their free-blooming qualities, brilliant and various-colored flowers, which last for a considerable time in blossom, make them popular with most people possessing even only a small greenhouse. Though they are herbaceous in character and may be propagated by cuttings or division of the roots, the single varieties are best treated as annuals, raising them from seed each year and throwing away the plants after flowering. Though anyone may save one's own seed, the Cineraria, like most hybrids, will deteriorate both in size and quality of the flower after one or two generations unless they are hybridized; therefore, unless one cares to hybridize his own plants, it is best to purchase fresh seed from some reliable firm who obtain their stock from hybridists. For florists' use, or where a succession of these flowers is required, two sowings of seed should be made; the first about the middle of August, and the second a month later. The seed should be sown in pans or shallow boxes one foot square; these should be well drained, and the soil should consist of one part fine loam, one part leaf-mold, and one part clean, sharp silver sand. The surface should be made very fine and pressed down evenly. The seed should then be sown evenly and rather thinly, and covered with sand about the eighth part of an inch. This will in a great measure prevent the seedlings from what gardeners term "damping-off," which they are very apt to do if the atmospheric conditions become at all stagnant. The seed-pans or boxes should be carefully watered with a fine rose and then placed in some cool, shaded place, such as a frame placed on sifted coal ashes on the north side of a wall or building, where they will germinate in about a week or ten days. As soon as large enough to conveniently handle, the seedlings should be potted into thumb-pots and grown on as rapidly as possible, shifting on into larger size pots as often as required, never allowing them to become the least pot-bound, or suffer in any way during the season of growth. The soil should consist of half leaf-mold and half fine fibrous loam, with a good sprinkling of silver sand, until the final shift into their flowering pots, when the soil should be three parts fibrous loam and one part well-decayed cow-manure or pulverized sheep-manure. About the first of October the plants should all be removed to the greenhouse, where the atmosphere should be kept cool and moist, but not stagnant. If a rainy spell should set in, a little artificial heat should be given to cause a circulation of the atmosphere, and as the fall advances the temperature should be kept about 45° at night, with a rise of ten degrees by day. Liquid stimulants should not be given until the flower buds begin to appear, when they are greatly benefited by an occasional watering of clear, liquid cow- or sheep-manure water. Cinerarias are very subject to the attacks of green-fly. To keep these in check, the house in which they are grown should be fumigated with tobacco about once in ten days, or tobacco stems placed among the plants if fumigating is objectionable.

Double-flowered varieties of Cineraria are not commonly grown, neither are they as beautiful as the single varieties. They may be propagated by seed or by cuttings, the latter being the best method, as a large percentage of seedlings are sure to turn out single, which will be inferior in size of flower as compared with the best single varieties. Double-flowering varieties must be propagated each year to obtain the best results. As soon as the plants have finished blossoming, the flower stalks should be cut away to induce the plants to make fresh growth, which, as soon as large enough for cuttings, should be taken off and inserted in an ordinary propagating bed, where they will soon root, after which they should be potted and shifted on as often as required, growing them during the hottest months in as

472. The florists' Cineraria—C. cruenta.

cool and shaded a position as can be provided. Of the different species of Cineraria from S. Europe, *C. maritima* is perhaps the best. It is of dwarf habit, with tomentose, silvery, pinnatifid leaves, and is a most useful subject for edging flower beds. It is not hardy in this climate, consequently must be treated as an annual, sowing the seeds early in March in the greenhouse, afterwards treating them as ordinary summer bedding plants. The other species from south and eastern Europe do not prove hardy here, and if grown should be treated as tender annuals, planting them in the herbaceous borders for the summer. The species from the Cape of Good Hope require greenhouse treatment, the culture being the same as for the common Cineraria, though, from an ornamental point of view, they would hardly pay for the room they would occupy.

Edward J. Canning.

CÍNNA (old Greek substantive). *Gramineæ.* Perennial woods grasses allied to Agrostis and Calamagrostis, with 1-fld., much-flattened spikelets, 1-nerved palet, 1 stamen, and a loose open panicle. The two northern species are offered by collectors: **C. arundinàcea**, Linn., with the branches of the panicle ascending or erect; **C. péndula**, Trin., with the branches very slender and drooping. These grasses (growing 3–7 ft.) are useful in wild borders.

CINNAMÒMUM (the ancient Greek name). *Lauràceæ.* Fifty or more trees and shrubs of Asia, mostly tropical, of which 2 or 3 are cult. in the extreme southern U.S. The lvs. are thick and ribbed, mostly opposite: fls. usually perfect, with 9 perfect stamens in 3 rows and a row of imperfect ones: fr. a small, 1-seeded berry, in a cup-like calyx: buds not scaly. The Cinnamon of commerce is mostly the bark of **C. Zeylánicum**, Nees; and this is sparingly cult. in S. Fla. and S. Calif. It is cult. in Ceylon and other oriental countries. It is a small tree, with ovate-oblong, shining, 3–5-nerved lvs., and small, yellow-white fls., in terminal, loose clusters. It is native to E. Ind. and Malaya. **C. Camphòra**, T. Nees and Eberm., is the Camphor tree. By some it is retained in the genus Camphora, and it will be found there in this book. **C. Cássia**, Blume, of Burma and China, furnishes Cassia bark or "Cassia lignea" of commerce. It is hardier than the *C. Zeylanicum.* It is a handsome tree, with stiff, long-oblong, acutish, 3-ribbed shining lvs., and small ;fls. in tomentose terminal or axillary panicles. The bark is thicker and coarser than that of *C. Zeylanicum*, and is used to adulterate Cinnamon. The unexpanded, clove-like flower-buds are often sold as Cassia buds. **C. Lourèirii**, Nees. A middle-sized tree of Cochin China, is rarely sold as a glasshouse plant. It has an aromatic odor. Lvs. opposite or alternate, rigid, elliptic or oblong. Petiole ⅓–½ in. long. There is a form with variegated lvs. **C. pedunculàtum**, Presl, from Japan, is also sold as a glasshouse subject. It is a glabrous tree, with thick, petioled, oblong-lanceolate, 3-nerved lvs., which are shining above. Petiole ½–¾ in. long.

The genus embraces tropical and semi-tropical shrubs and trees, which are mostly of economic value, and in one or more cases are valuable shade trees for lawn and street planting. The lvs. are evergreen, usually of a rich, shining green, and in *C. Camphora* have a silvery blue color on the under surfaces. *C. Camphora*, the Camphor tree, is hardy in the lower Gulf states, and is now being extensively planted, both for shade and extraction of gum (see *Camphora*). *C. Cassia* is not quite so hardy, but withstands a temperature of 20° Fahr. without injury, and has been planted in Florida for manufacture of its various products,—oil, gum, buds and cinnamon bark. The true Cinnamon of commerce is prepared from the bark of *C. Zeylanicum*, a tropical species, likely to be extensively grown in Mexico and the West Indies. The various species are usually propagated by seeds, which are sown as soon as ripe in a shaded bed, the seedlings being transplanted when very small into pots and kept thus growing until permanent planting out. The species, without exception, are very difficult to transplant from the open ground, and hence pot-grown plants are almost a necessity. Cuttings of half-ripened wood of some species may be rooted in the spring in moderate heat, following the usual method of preparation, and planting in coarse sand. The soil best suited to Cinnamomums in general, and *C. Camphora* in particular, is sandy loam, although a heavy loam, where well prepared, answers fairly well. The sandy soil of Florida, when moderately manured, suits all species so far tried admirably.

E. N. Reasoner and L. H. B.

CINNAMON VINE. A name for species of *Dioscorea.*

CÍNQUEFOIL. A species of *Potentilla.*

CIRCǼA (Circe, the enchantress). *Onagràceæ.* A few species of low woods herbs in N. Amer. and Eu., two of which are in the trade for growing in shady places and about garden bogs. They are interesting little plants, but not showy. Of easy culture in shady, damp spots. Lvs. opposite and stalked: fls. perfect, small, and white, in terminal and lateral racemes; calyx tube hairy: fr. a small, bristly bur.

Lutetiàna, Linn. Erect and branching, 1–2 ft., the stem swollen at the nodes: lvs. ovate-acuminate, more or less rounded at the base: pedicels slender, reflexed in fruit: fr. 2-celled. Woods, E.

Pacífica, Asch. & Mag. From 6–12 in.; smaller than the above, lvs. less acuminate, fls. smaller, fr. 1-celled and less bristly. Col., N. and W. L. H. B.

CIRRHOPÉTALUM (*tendril petal*, alluding to the narrow lateral sepals). *Orchidàceæ*, tribe *Epidéndreæ.* Nearly 50 Old World tropical orchids, none of which are in the American trade. The tail-like lateral sepals give the fls. an odd appearance. Allied to Bulbophyllum. They are epiphytes, and are grown in baskets or on blocks in a warmhouse. Leading species are: *C. Cumingii*, Lindl. (B.M. 4996); *C. Medusæ*, Lindl. (B.M. 4977. I.H. 39:154. G.C. III, 21:25); *C. picturatum*, Lodd. (B.M. 6802); *C. pulchrum*, N. E. Brown (I. H. 33:608. A. F. 6:609); *C. Thouarsii*, Lindl. (B.M. 4237). *C. Sinense* is evidently a trade name.

Being of rambling habit, with creeping rhizomes, Cirrhopetalums should be grown in baskets, sufficiently large to afford plenty of growing surface, and suspended from the roof, where they will get plenty of light and free access of air to the roots, which is equally essential. Liberal allowance must be made for drainage, which should consist of either broken potsherds or charcoal, the latter being preferable, as it is light, durable and contains nothing detrimental. Two-thirds osmunda, or other clean fiber, and one-third chopped live sphagnum moss, well mixed together, afford a good compost; and after this has been carefully tucked in about the roots and interstices, the plant should be held firm with brass or copper wire until reëstablished. The compost should be used rather sparingly to prevent over-watering. Many of the smaller-growing species do very well on orchid blocks, firmly attached, with a small quantity of compost beneath them. During the winter months, little or no shade is required. The temperature may range from 58° to 65° F. by night, with about 10° rise through the day, or even a little more, with sun-heat, will do no injury. No artificial heat is necessary in summer, except in extreme cold or wet weather, but a shaded, moist location should be selected, such as is afforded in the cattleya or palm department. When the plants are dormant, light syringing overhead will keep the compost moist and the plants in healthy condition, but as the growing season advances, a liberal quantity of water and copious syringing in bright weather will be necessary. The stock is increased by division, the most judicious method being to cut nearly through the rhizome with a sharp knife, about three pseudobulbs behind the lead, just before growth action, allowing the part to remain until the dormant eyes start to grow, when it may be removed and treated as an established plant. A little extra heat and moisture at this period will prove beneficial with the weak plants. All are of moderately easy culture.

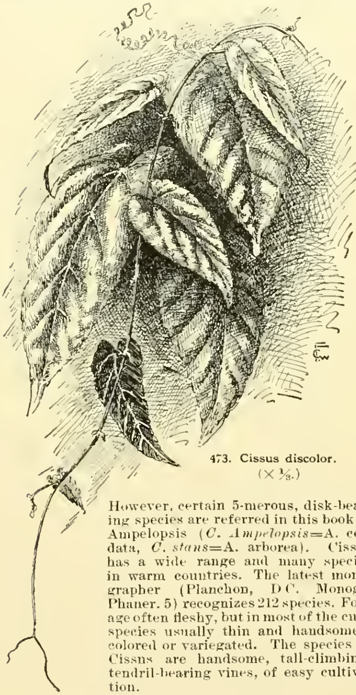
Robt. M. Grey.

CÍRSIUM. Refer to *Cnicus.*

CISSÁMPELOS (Greek for *ivy* and *vine*). *Menispermàceæ.* Vines: fls. in axillary racemes or clusters, the plant diœcious; sterile fls. with 4 or 2 sepals and as many petals united, the anthers 2–4, on a staminal column; fertile fls. with 2 united fleshy sepals, subtended by a sepal-like bract, and solitary ovary, with 3 styles: fr. a subglobose drupe, with a flattened and tuberculate stone. Many species or distinct forms in tropical regions, but many of them are evidently forms of the widely distributed **C. Pareira,** Linn. This plant, as *C. heterophylla*, DC., and under other names is cult. in S. Fla. and the tropics. It is known as Velvet-leaf and Pareira Brava. It is an exceedingly variable vine, with downy, round-cordate or peltate lvs., the sterils fls. in stalked corymbs and the fertile in large-bracted racemes, and a hairy, nearly globular, red fruit. It occurs in all tropical countries.

L. H. B.

CÍSSUS (Greek name of *ivy*). *Vitàceæ.* Very like Vitis, but differing in having the parts of the flower in 4's, the corolla not falling off as a cap, and the disk about the ovary ring-like or cup-like. Ampelopsis is distinguished by 5-merous fls. and the absence of a disk.



473. Cissus discolor. (× ⅓.)

However, certain 5-merous, disk-bearing species are referred in this book to Ampelopsis (*C. Ampelopsis*=A. cordata, *C. stans*=A. arborea). Cissus has a wide range and many species in warm countries. The latest monographer (Planchon, DC. Monogr. Phaner. 5) recognizes 212 species. Foliage often fleshy, but in most of the cult. species usually thin and handsomely colored or variegated. The species of Cissus are handsome, tall-climbing, tendril-bearing vines, of easy cultivation.

A. *Lvs. fleshy, 3-lobed or 3-foliolate.*

ácida, Linn. Low climber, with slender and striate somewhat fleshy glabrous branches: lfts. or leaf-divisions rather small, broad-cuneate and sharply toothed near the apex: fls. small, in corymb-like or umbel-like clusters: fr. an ovoid and mucronate dark purple berry, with 1 or 2 large seeds, the pedicel being recurved at maturity. Key West and S.; also, in Ariz. and S.—Sometimes planted.

incìsa, Desm. (*C. Rocheàna*, Planchon). Climbing 20–30 ft., the stems very fleshy and the tendrils root-like: lvs. pale green, very fleshy; lfts. or divisions wedge-ovate, notched on both sides and top, the middle one sometimes again lobed: inflorescence umbel-like: fr. an obovoid blackish berry, with 1 or 2 seeds, the pedicel being strongly recurved. Fla., to Ark. and Tex. R.H. 1884, pp. 272–3.—Often planted in the extreme S. Sometimes called "Marine Ivy."

AA. *Lvs. not fleshy, not lobed.*

discolor, Blume. Fig. 473. Lvs. oblong-ovate, acuminate, cordate at base, bristly serrate, reddish beneath, velvety green and mottled with silvery white above: both lvs. and stems glabrous, the latter red and more or less angled: fls. small and yellowish, in dense and very short, axillary clusters. Java. B.M. 4763. L. 13. F.S. 8:804–5.—One of the best of all warmhouse foliage plants. Easily grown. Prop. by cuttings. Must have a season of rest, usually in spring or early summer. If wanted for winter growth, temperature must be about 75°. Known to some as "Trailing Begonia."

Antárctica, Vent. (*C. Baudiniàna*, Brouss.). Kangaroo Vine. Lvs. rather thick, glossy, ovate to oblong, very short-acuminate, rounded at base, mostly strongly toothed or notched, green: fls. green, in few-fld., axillary clusters: fr. a globular berry. Austral. B.M. 2488.—Valuable for cool greenhouses, but does not withstand frost. Grows well on walls in darkish and neglected places.

Amazónica, Linden. Lvs. glabrous and glaucous, oval-acuminate and narrower, reddish beneath and silvery veined above. Brazil.—Warmhouse climber.

álbo-nitens, Hort. Lvs. oblong-acuminate, more or less cordate at base, silvery white and shining over the upper surface. Brazil.—Warmhouse climber.

sicyoides, Linn. Branches terete or compressed, tuberculate or smooth, striate: lvs. ovate or oblong, often cordate at base, margin more or less serrate or even cut, thickish, green: inflorescence corymb-like, opposite the lvs., the fls. small, and varying from greenish to white and purplish: fr. an obovoid, 1-seeded berry. Very widely distributed in trop. Amer., and exceedingly variable. One form (var. *Floridàna*, Planch.), occurs in S. Fla., but is not in the trade. The *C. argéntea* of horticulturists is var. **ovàta,** Planch., which has glabrous ovate or ovate-oblong remotely serrate and somewhat glaucous lvs. Called "Season Vine" in tropics.

C. Davidiàna, Carr., is a Vitis (which see).—*C. Líndeni*, André (I.H. 17:2), is perhaps an offshoot of C. sicyoides. It has large ovate-cordate silver-blotched lvs.—*C. Japónica*, Willd. Herbaceous, glabrous: lvs. 5-foliolate, with serrate-oblong lfts.: fls. greenish; cymes many-fld. Jap., Java, Austr. The only species hardy north.—*C. porphyrophýlla*, Lindl., is a Piper (which see).—*C. striàta*, Ruiz. & Pav. (Ampelopsis sempervirens, Hort.). Low, shrubby evergreen vine: lvs. small, 5-foliolate, with cuneate-oblong lfts., serrate above the middle: fls. yellowish, in many-fld. cymes. Chile, S. Braz. Graceful small climber for the cool greenhouse.—*C. Vèitchii*, Hort.=Ampelopsis tricuspidata.

L. H. B.

CÍSTUS (ancient Greek name). *Cistàceæ.* Rock Rose. Shrubs, usually with villous and glandular tomentum, aromatic: lvs. opposite, mostly persistent, entire, the opposite petioles connate at the base: fls. large, in terminal and axillary cymes at the end of the branches, rarely solitary, white to purple; petals 5; stamens numerous; capsule many-seeded, splitting into 5 valves. About 30 species in the Mediterranean region. Ornamental, free-flowering shrubs, usually only a few feet high, with very showy purple or white fls., similar to a small single rose, appearing in early summer. They are only hardy in warmer temperate regions, but many of them will stand 10° of frost without injury, and *C. laurifolius* even more. They thrive best in a well drained, light soil, mostly preferring limestone soil, and in a sunny position; the dwarfer species are well adapted for rockeries with southern aspect. The Cistuses do not bear transplanting well, and should be grown in pots until planted out. Some species yield ladanum, a resin, used in perfumery. Prop. by seeds sown in spring in pans or boxes and the young seedlings shaded; increased also by layers and cuttings in spring or late summer, inserted in sandy peat under glass. Illustrated monograph: R. Sweet, Cistineæ (S.C. of the following pages). In the Old World, the Cistuses are important garden plants, but they are little known in America.

A. *Fls. purple or red.*

B. *Fls. 1½–2 in. wide; petals imbricate.*

villòsus, Linn. (*C. incànus*, Linn.). Erect shrub, 3–4 ft., villous or tomentose: lvs. penninerved, roundish-ovate or oblong, narrowed into a very short petiole, rugose above and grayish green, tomentose or villous beneath, 1–2 in. long: fls. 1–3, long-peduncled, reddish purple, 2 in. wide; petals light pink or yellowish at the base. May, June. Mediterr. region. B.M. 43. S.C. 35. —A very variable species. Var. **Créticus**, Boiss. Lvs. smaller, more spatulate at the base: fls. purple. Fl. Græca 5: 495. S.C. 112. Var. **canescens**, Nichols. Lvs. elliptic-oblong or narrow-oblong, obtuse: fls. dark purple. S.C. 45. Var. **rotundifòlius**, Loud. Dwarfer, with more roundish lvs. S.C. 75. Var. **undulàtus**, Willk. Lvs. linear-oblong, acute, undulate: fls. solitary. S.C. 63.

crispus, Linn. Compact shrub, to 2 ft., villous: lvs. sessile, 3-nerved, linear-lanceolate or oblong-elliptic, undulate, rugose above, villous beneath: fls. 3–4, nearly sessile, 1½–2 in. wide, deep rose-colored. June–August. S. W. Europe. S.C. 22.

heterophýllus, Desf. Erect, to 2 ft.: lvs. short-petioled, elliptic- or oval-lanceolate, green on both sides and slightly hairy, ½–1 in. long: fls. 1–3, 2 in. wide; petals red, yellow at the base. N. Africa. S.C. 6.—More tender.

BB. *Fls. 1 in. wide, petals not imbricate.*

parviflòrus, Lam. Much branched shrub, 1–2 ft.; tomentose: lvs. 3-nerved, elliptic-ovate, undulate rugose above, reticulate beneath, twisted, 1 in. long: fls. 3–5; petals pale rose, yellow at the base. June. Greece, Crete. S.C. 14.

AA. *Fls. white: lvs. 3-nerved.*

Cýprius, Lam. Erect shrub, to 6 ft., glutinous: lvs. oblong-lanceolate, glabrous above, villous-tomentose beneath: fls. 5–7, nearly 3 in. wide; petals blotched purple at the base. June. Cyprus. S.C. 39.

ladaniferus, Linn. Shrub, to 4 ft., glutinous: lvs. short-petioled, lanceolate, glabrous and viscid above, whitish tomentose beneath, 1½–4 in. long: fls. usually solitary, long-peduncled, 3–3½ in. wide; petals yellow at the base. June. S. W. Europe. S. C. 84.—Var. **maculàtus**, Sweet. Petals with a dark brownish crimson spot above the base. B.M. 112. Gn. 30: 552. S.C. 1. Probably the most beautiful of all Cistus.

laurifòlius, Linn. Shrub, to 6 ft.: lvs. petioled, ovate or ovate-lanceolate, glabrous above, whitish or brownish tomentose beneath, 1–2½ in. long: fls. 3–8, 2–3 in. wide; petals with yellow blotch. June–August. S. W. Europe. Gn. 53, p. 131. S.C. 52.—The hardiest species.

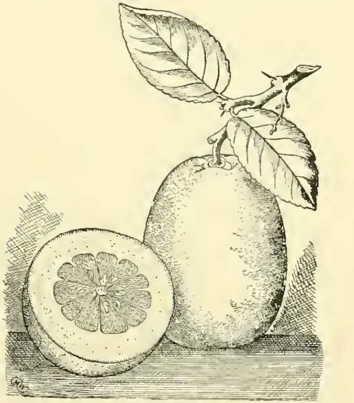
C. álbidus, Linn. To 4 ft.: lvs. sessile, whitish tomentose: fls. 3–8, lilac or rosy, 2½ in. S.W. Europe. S.C. 31.—*C. Algarvènsis*, Sims = Helianthemum ocyimoides.—*C. candidíssimus*, Dun.; S.C. 3 = C. vaginatus, var.—*C. Corbariènsis*, Pourr. (C. populifolius×salvifolius). To 5 ft.: lvs. slightly cordate, glutinous: fls. 1–5, white, 1½ in. S.C. 8.—*C. Cupaniànus*, Presl. To 3 ft.: lvs. cordate-ovate: fls 2–3, white. Sicily. S.C. 70.—*C. Florentìnus*, Lam. (C. Monspeliensis×salvifolius). Dwarf: lvs. lanceolate: fls. white, 2 in. Gn. 27: 497, and 53, p. 134. S.C. 59.—*C. formòsus*, Curt. = Helianthemum formosum.—*C. glaùcus*, Pourr. = C. Ledon.—*C. hirsùtus*, Lam. One to 3 ft., clothed with spreading and glandular hairs: lvs. sessile, lanceolate: fls. 1–5, white. S.W. Europe. S.C. 19.—*C. latifòlius*, Sweet; S.C. 15 = C. populifolius, var.—*C. làxus*, Ait. = C. longifolius.—*C. Lèdon*, Lam. One to 2 ft.: lvs. lanceolate, glossy above: fls. 5–10, white, 1½ in. S. France.—*C. longifòlius*, Lam. Two to 4 ft., glandular: lvs. oblong-lanceolate, glossy above: fls. white, 1½ in. S. W. Europe. S. C. 12. Variable.—*C. Monspeliènsis*, Linn. To 5 ft.: lvs. sessile, lanceolate: fls. white, cymose, 1 in. S. Europe. S.C. 27.—*C. oblongifòlius*, Sweet; S.C. 67 = C. longifolius, var.—*C. obtusifòlius*, Sweet; S.C. 42 = C. longifolius, var.—*C. populifòlius*, Linn. To 6 ft., glutinous: lvs. petioled, cordate, acuminate, rugose above: fls. white, cymose, 2 in. S.W. Europe. S.C. 23.—*C. purpùreus*, Lam. Three to 4 ft.: lvs. oblong-lanceolate, rugose above: fls. 1–6, reddish purple; petals yellow at the base and with maroon blotch above. Orient. Gn. 31: 591; 45, p. 33. B R. 5: 408. S.C. 17.—*C. salvifòlius*, Linn. To 2 ft.: lvs. oval, obtuse, tomentose, small: fls. 1–2, white, 1½ in. S. Eu., Orient. S C. 54.—*C. vaginàtus*, Linn. (Rhodocistus Berthelotianus, Spach). To 2 ft.: lvs. petioled, ovate, acuminate: fls. cymose, deep rose-colored, yellow in center. Canary Islands. S.C. 9. B.R. 3: 225. F.S. 15: 1501.

ALFRED REHDER.

CITRON. A form of Watermelon.

CITRON (*Citrus Mèdica*, var. *genuìna*). See *Citrus*. Fig. 474.—A large, thick-rinded, lemon-like fr., somewhat cult. in Flor. and Calif. The rind is used in the making of preserves and confections.

The Citron is propagated by cuttings, layers, budding, and grafting. The usual method of propagating is by budding on a vigorous stock, in Florida preferably the rough lemon ("French lemon" or "oranged loomie"), but also on the sour orange. Grafting is so uncertain, owing to the prevailing high temperature, that it is seldom attempted. Cuttings of ripe wood root readily, both in the open ground and the propagating house. For open ground, select wood thoroughly ripe in December, and cut in lengths about 6 to 10 inches; clip off all but the top leaf, and insert in rows in well-drained soil, leaving the top bud exposed to the air. Watering must be thoroughly kept up until the succeeding rainy season. A shade of lath or brush should be provided the rows of cuttings. By November of the following year, the young plants will be sufficiently well rooted to transplant. By making short cuttings, 2 or 3 inches long, of ripe wood, and inserting in the moist sand of the propagating house, less wood is necessary and a higher percentage of rooted plants will result in a shorter period. These cuttings may be inserted at any time of year, but winter and early spring are preferable. The young rooted plants may be grown into large size in the nursery, until wanted for orchard setting. Layers are easily rooted by pegging down low branches of the Citron during the rainy season. They do not make such symmetrical trees as those grown from cuttings, or by budding.



474. Citrus Medica, the Citron (× ¼).

The site for the Citron orchard should be on well-drained land, either naturally, or otherwise, of the best quality, similar to that selected for the lemon. In orchard planting, the trees should be set about 15 x 24 feet apart (although this is not arbitrary), as sufficient room should be allowed for cultivation, hauling fertilizer and fruit, and plenty of sunlight and air. An abundance of sunshine and breezes are the greatest aids in keeping down insect pests and fungous troubles. The Citron is rather low-growing and inclined to make long lateral branches, which, if not cut back occasionally, touch the ground and form roots, rendering cultivation and fruit-gathering difficult. Cultivation is essentially the same as for the orange and lemon: shallow plowing in December at the time of applying fertilizer, followed by thorough harrowing every two or three weeks until the latter part of June. This keeps the top soil loose, conserving the moisture, and keeping down weeds and grass during the dry season. After the rains set in during the summer all cultivation is stopped, and grass, beggar-weed, or field-peas allowed to cover the ground, preventing sunburning and providing a source of humus so necessary in keeping up proper fertility and texture of the sandy soil of Florida.

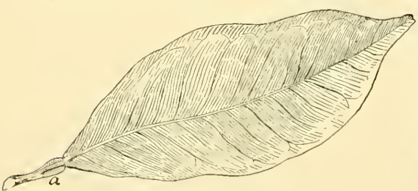
E. N. Reasoner.

CITRÚLLUS (from *Citrus*). *Cucurbitàceæ.* The genus which includes the Watermelon. Cogniaux, the latest monographer (DC. Monogr. Phaner. 3), recognizes three species, all of the Old World, with the largest dispersion in Africa. Plant monœcious, the two kinds of fls. solitary in the axils of the lvs.: fls. with a short, bell-like calyx tube and a deeply 5-cleft, yellow corolla. **C. vulgàris,** Schrad., is the Watermelon (which see), native to tropical and south Africa. **C. Colocýnthis,** Schrad., is the Colocynth, extract from the fruit of which furnishes a well-known purgative drug. It is native to the Mediterranean region and tropical Africa. The fruit is small and globular, gourd-like, smooth and partly colored, the flesh very bitter: lvs. deeply divided. L. H. B.

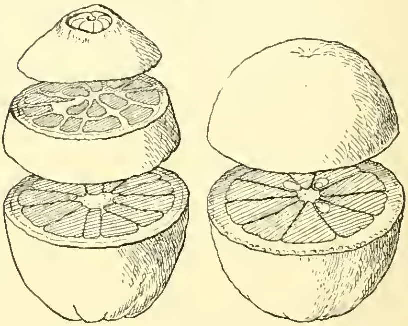
CÍTRUS (ancient name for Citron). *Rutàceæ.* Orange, Lemon, Citron, etc. Aromatic, glandular shrubs or small trees, mostly thorny: lvs. alternate, with more or less winged petioles, compound, mainly unifoliolate (appearing as a simple leaf but really compound, as shown by the joint between the petiole and lamina. Fig. 475), in one species trifoliolate: fls. hermaphrodite; calyx cupulate, 3–5-toothed; petals 4–8, linear-oblong, thick, glandular, imbricated in the bud; stamens numerous, 20–60, occasionally only 5; filaments more or less united; disk cushion-shaped; ovary compound, composed of 5 to many united carpels, with a single style and stigma, and central axial placenta; ovules 4–8 in each carpel, arranged in two rows: fr. a round, oblong or pear-shaped berry with leathery rind, containing numerous oil glands and juicy, aromatic pulp: seeds white, exalbuminous, with leathery coats, frequently containing 2 or more embryos. Native of tropical and subtropical Asia. Several species are extensively cultivated and have given rise to numerous cultivated forms. The so-called navel oranges have a second series of cells developing in the center of the fr., this being an incidental variation (Cf. Fig. 476). See *Citron, Lemon, Lime, Orange, Pomelo.*

A. Pseudo-Ægle.—*Lvs. trifoliolate, deciduous, with elliptical, dentate or crenate lfts.: fls. white, 1–2 in the axil of each leaf, opening before the lvs. appear in spring; petals spatulate: ovary and disk hairy.*

trifoliàta, Linn. (*C. tríptera,* Desf. *Ægle sepiària,* DC.). Trifoliate Orange. Figs. 477, 478, 479. A small tree armed with very strong, stiff thorns, 1–1½ in. long: fr. golden yellow, about the size of a walnut, covered with short hairs; pulp rather dry, sour and bitter. Jap., and cult. widely in the United States. R.H. 1869, p. 15; 1877, p. 73; 1885:516; 1886, p. 533. Gn. 46:980 and p. 273. Mn. 3:101.—The fr. of the Trifoliate Orange is worthless as a whole, but is sometimes used for preserves. The plant is largely used for hedges, for which it is well adapted, forming a close, compact growth that nothing can penetrate. It is also used as a hardy stock on which to bud certain oranges and lemons, particularly the Satsuma and Kumquat. It is said to have the effect of somewhat dwarfing the more robust orange varieties budded on it, and of making them more hardy by rendering them dormant earlier in the fall, and retarding them from starting early in the spring. The Trifoliate Orange is hardy as far north as Philadelphia and New York. It is propagated by seeds, which are very numerous. Hybrids have been made between this and the common orange. The Trifoliate Orange is frequently listed in trade catalogues under the names *Limonia trifoliata* and *Triphasia aurantiola.* These are tender, tropical shrubs, and should not be confused with the hardy *C. trifoliata.*



475. Leaf of Orange.



476. Normal orange on the right; abnormal or navel orange on the left, showing the adventitious cells in the center.

AA. Eucitrus.—*Lvs. unifoliolate, evergreen: petals oblong: ovary and disk glabrous.*

Aurántium, Linn. (*C. vulgàris,* Risso). Orange. Figs. 476, 480. A small tree or shrub: young shoots light green, glabrous: lvs. elliptical or ovate, acute, obtuse, or acuminate; petiole narrowly or broadly winged: fls. hermaphrodite, pure white: fr. oblate-spherical or elliptical, not mamillate.

Var. **amàra,** Linn. (*C. Bigaràdia,* Duham.). Sour, Bitter, or Seville Orange. Lvs. deep green, ovate, pointed, very aromatic; petiole broadly wing-margined: fls. white, sweet-scented: fr. round, dark orange, frequently with tinge of red, very aromatic; rind somewhat rough; pulp sour and bitter. Southeastern Asia, and cult. in tropical and subtropical regions throughout the world.—There are very few cultivated sorts of this variety or subspecies grown in the United States, and of these only the two following are well known: Sour ("sour orange"): Fr. deep orange or orange-red; pulp very sour. This is grown very extensively as a stock on which to bud varieties of the sweet orange, lemon, pomelo, etc. Very valuable as a stock because resistant to the serious disease mal-di-gomma or foot-rot.—Bitter Sweet: Fr. of same external appearance as the Sour Orange but mildly acid and pleasant to the taste. Cultivated mainly for home use. The Sour Orange was evidently introduced into Florida very early by the Spaniards, and escaped from cultivation, becoming established as a wild species here and there throughout the peninsular portion of the state. In this wild state it was limited to moist lands near streams and lakes, in the so-called hammocks; and in some instances grew abundantly among the larger forest trees, over areas of 100 acres or more. The fls. of this var. *Amara* are slightly bitter, and are the officinal *Folia aurantii* or *Folia citri vulgaris.* An ethereal oil is manufactured from the fls., young sprouts and unripe fr. The pleasant-smelling, bitter Bigaradia oil is taken from the rind of the ripe fr. Large quantities of oil for perfume are manufactured from the fls. in southern France. The fr. is used for marmalade, and makes a very refreshing drink known in Florida as "orangeade."

Var. **Bergàmia,** Wight. & Arn. Bergamot Orange. A bush or small tree: lvs. oblong; petiole wing-margined, of medium width: fls. small, white, sweet-smelling: fr. medium size, pear-shaped, smooth, light yellow, pulp subacid, greenish yellow. Cult. in Eu. since the seventeenth century. Only rarely cult. in the United States. B.M. 7194.—Bergamot oil is manufactured from the rind of this subspecies.

Var. **Sinénsis**, Engler. (*C. Auràntium*, var. *dúlcis*, Linn. *C. Tahiténsis*, Hort.). Common Sweet Orange, including the Malta or Portugal Orange. Tree, 20–35 ft.: young branches pale green, angular, glabrous: lvs. oblong-ovate, pointed; petiole narrowly winged: fls. large, white: fr. mainly round, occasionally elliptical or ovate, orange or yellowish; pulp when ripe sweet or slightly acid. India. Cultivated extensively in all tropical and subtropical regions of the world.—The Sweet Orange is valued mainly for its sweet, delicious fruit, which is eaten raw or made into marmalades, wine, etc. The rind is sweet and aromatic, and is used for culinary purposes. The extensive cultivation of the orange has led to the development of numerous variations, some 70 varieties being cultivated in the United States. Some of these forms are propagated fairly true to seed, but the majority are not, and must be propagated by budding or grafting. The following is a list of some of the most highly prized of the cultural forms: Bahia (also known as Washington Navel and Riverside Navel): Fig. 476. Fr. large, solid and heavy, seedless, with prominent navel mark at apex; pulp juicy and of fine texture. Introduced from Brazil. The most popular variety cultivated in California, where it bears heavily. In Florida it is a shy bearer.—Boone (Boone Early): Fr. round, medium size, fair quality; very early. Florida.—Centennial: Fr. round, medium size, early medium, quality excellent. Florida.—Du Roi: Fr. round, small or medium size, late medium; seeds ribbed: thorns few. An excellent fruit in Florida, but has not given satisfaction in Cal. Foreign.—Hart Late (Tardive, Excelsior): Fr. oval, medium size, solid, pale yellow. One of the best late sorts, holding on tree in Florida until May. Foreign.—Homosassa: Fr. round, of good quality, midseason. Florida.—Jaffa: Fr. round, heavy, juicy and of very best quality, midseason; skin thin: tree nearly thornless. Foreign.—Jaffa Blood: Fr. oval, small, of excellent quality. Florida.—Lamb Summer: Fr. oval, medium size, of good quality, very late; one of the best late sorts, ranking with the Hart Late. Florida.—Majorca: Fr. round, medium size, heavy and very juicy; skin smooth and thin; quality excellent. Foreign. One of the very best late midseason sorts.—Maltese Blood: Fr. oval, small, orange red, juicy and sweet, of very best quality; pulp reddish or streaked with red; midseason. Foreign. Mediterranean Sweet: Fr. large, oval, of good quality, late. Foreign.—Parson (Parson Brown): Fr. round, medium size, of fair quality; very early. Florida. Very extensively planted as an early variety in Florida.—Ruby: Fr. medium size, round, of excellent quality; pulp reddish or streaked with red. Foreign.—St. Michael: Fr. round, medium size, quality fair, midseason. Foreign.—St. Michael Blood: Fr. round, medium size, quality the very best; pulp reddish or streaked with red. Foreign. This Orange seems to the writer superior in flavor to any he has ever tested, though there is but little noticeable difference between any of the best sorts, much, doubtless, depending on the conditions under which the fruit is grown.—Valencia (Valencia Late): Fr. large, oval, light orange, of good quality, very late. Foreign. One of the most highly prized varieties in California.

477. Citrus trifoliata. (× ½.)

478. Citrus trifoliata.

The so-called Otaheite Orange (*C. Aurantium*, var. *Otaitense*, Risso & Poit.) is probably to be considered a variety of *C. Aurantium*, var. *Sinensis*. Reasoner thinks it is Gallesio's "*C. Aurantium Sinense pumilum fructu dulci.*" The foliage resembles that of a lemon, and the flowers are pinkish. The fruit is small, slightly flattened, rough, and reddish orange in color; pulp mainly sweetish, sometimes sour. It may be a hybrid of orange and lemon. It is used extensively as a dwarf pot plant, for which it is well suited.

nóbilis, Lour. Mandarin, or Kid-glove Orange. Shrubs or very small trees, with dense foliage: lvs. small, lanceolate, weakly crenate; petioles short, scarcely winged: fls. small, white, fascicled; filaments only slightly united: fr. compressed, spherical, or somewhat pyriform, 5–6 cm. in diameter; rind orange-yellow or reddish, loose, baggy, and easily removed; segments 9–10, loosely adherent; pulp sweet; seeds ovate or oblong, green when cut: odor of leaves, twigs, fruit, etc., very characteristic in all varieties and easily recognizable. Cochin China or China. Cultivated extensively in tropical and subtropical regions free from hot winds, to which it is said to be very sensitive.—The principal horticultural varieties grown in the United States are the following: China ("Mandarin," "Willow-leaved Mandarin," etc.): Fr. small, light orange, early medium, excellent quality: lvs. small, myrtle-like. Foreign.—Dancy Tangerine: Lvs. larger, nearly the size of those of the common orange: fr. dark orange or reddish, early medium, quality excellent. Florida. The most prized of any of the Mandarin Oranges cultivated in the United States.—King: Fr. large and rough, dark orange, late: young twigs blackish. A good late sort. Foreign.—Satsuma (Oonshiu): Fr. medium size, flattened at the ends, orange, early, quality fair. Foreign. A much valued early ripening sort, which is somewhat more hardy than the common sweet orange, particularly when budded on the hardy trifoliata orange stock.—Tangerine: Fr. very early, light orange, medium size. Foreign.

479. Citrus trifoliata. Natural size.

Decumàna, Linn. (*C. Pomelànus*, Hort.). POMELO, PUMELO, SHADDOCK, GRAPE-FRUIT, POMPELMOS, etc. Tree small, 25–30 feet high: young shoots slightly pubescent, finally becoming smooth: lvs. large, ovate or ovate-oblong, obtuse, frequently emarginate; petiole broadly winged: fls. large, white; stamens 16–24: fr. pale lemon-yellow, or in some cases reddish or flesh colored, globose or pyriform, very large, in hort. vars. reaching 6-7 in. in diameter and weighing 8–12 lbs.; rind smooth, thick, very bitter; pulp pale yellow, in some reddish, sweet or acid. Malayan and Polynesian Islands. Extensively cultivated in India, Florida and California, and in most tropical and subtropical countries. A.G.11:717. Mn.9:47.—The Pomelo is an excellent dessert fruit, and is being very extensively planted, particularly in Florida. The majority of the horticultural varieties cultivated in America have originated in Florida, though some valuable sorts have been introduced. The round-fruited sorts, commonly called Pomelos or Grape-fruits, are the most valuable commercially. The pear-shaped sorts, or Shaddocks, are cultivated more as curiosities, and are seldom found in the markets. *Round varieties—Pomelos:* Aurantium: Fr. late medium, size medium. Florida.—Josselyn: Fr. large, late medium, quality good; prolific. Florida.—Hart: Fr. late medium, large, of very good quality. Florida.—Marsh (Marsh's Seedless): Fr. with very few seeds, said to be of good quality and prolific, of recent origin. Florida.—Pernambuco: Prolific: fr. late, large: thorns short. South America.—Royal: Fr. small, early medium, only slightly bitter; prolific. Florida.—Tresca: Pulp rose-colored, said to be of excellent quality. Bahama Islands.—Triumph: Fr. small, late medium, quality very good. Florida.—Walter: Fr. late medium, large, of recent origin. Florida. *Pear-shaped varieties—Shaddocks:* Blood: Fr. large; pulp reddish or flesh-colored, of fair quality.—Mammoth: Fr. very large, but practically worthless.—"Forbidden Fruit": Fr. small, orange-colored, of fair quality. The so-called "Bell Grape-fruit" is probably identical with this.

Japónica, Thunb. KUMQUAT, KIN-KAN, KIN-KITS, etc. Fig. 481. A low bush, with smooth, angular branches: lvs. small, linear-lanceolate, slightly serrate, pointed or blunt, wedge-shaped at the base; petioles narrowly wing-margined: fls. small, solitary or in clusters, in the axils of the lvs.; petals 5; stamens about 20, filaments united: fr. small, often only ¾ of an in. in diam., ovate, oblong or spherical, orange-colored, 5–6-celled; pulp sour; rind sweet. Cochin China or China. Cultivated extensively in Japan, Florida and California. R.H. 1875, p. 209. The following are the two cultivated varieties commonly grown in the United States: Marumi (Round Kumquat): Fr. round, small, ¾–1¼ in. in diam.: tree slightly thorny.—Nagami (oval or oblong Kumquat): Fr. ovate or oblong, ¾–1 in. in diam. and 1¼–2 in. long: tree thornless.—The fruit of the Kumquat, as it is most commonly called in America, is coming to be much prized for preserving, and is also used fresh to considerable extent, the sweet rind, as well as the pulp, being eaten. Both the round and the oval sorts have beautiful dense, dark green foliage, and form excellent orange trees of dwarf habit for pot culture. They are commonly budded or grafted on trifoliata or sweet orange stocks.

Mèdica, Linn. (named for the country Media). Fig. 474. CITRON, in the broadest sense, including citron, lemon and lime. Bush or small tree: young shoots glabrous, mostly reddish or purplish, in some yellowish green: lvs. smooth, oblong, acute: fls. hermaphrodite or frequently unisexual, mostly reddish or tinged with red without: fr. spherical, ovate or oblong, often mamillate at apex. India.—A very variable species, much modified by cultivation and apparently mixed by hybridization, so that it is almost impossible to determine the relationship of the different forms.

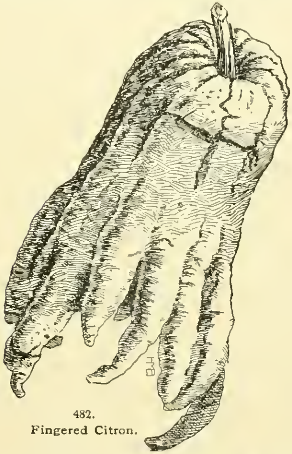
Var. **genuìna**, Engler. CITRON proper. Lvs. oblong, serrate or crenate; petiole short, wingless: fr. large, frequently 3–4 in. in diam. and 6–7 in. long, mostly ovate-oblong, mamillate; rind very thick, tender, aromatic, more or less rough and warted (rugose); pulp but slightly developed, dry (lacking in juice), acid or sub-acid.—The Citron is cultivated to some extent in Florida and California, but not so extensively as in Italy and the Mediterranean region. All varieties are very tender,

480. Orange flowers. (×½.)

probably being the most easily injured by cold of any of the citrous fruits. It is prop. by seeds, cuttings, layering, etc. The cultivated varieties do not propagate true to seed, and must be budded or grafted. The fr. is prized for the thick, tender, aromatic rind, which is preserved or candied, and used extensively for culinary and confectionary purposes. Many forms and horticultural varieties are grown in Florida and California, but none have thus far proved of noteworthy commercial value. The Corsican, a variety recently introduced by the U. S. Department of Agriculture from Corsica, has given evidence of being a desirable commercial sort for cultivation in this country.

Var. **Lìmon**, Linn. LEMON. Small, spreading trees or shrubs: young branches smooth, yellowish green: lvs. ovate-oblong, crenate or serrate; petiole short, marginless or slightly winged: fr. medium sized, yellow, round, ovate or elliptical, mostly mamillate; rind thin, aromatic; pulp abundant, very juicy and acid. India. Cultivated extensively in all tropical and subtropical regions of the world.—The Lemon is one of our most important commercial fruits, and is grown extensively in California and Florida. Large quantities of the fruit are also imported, mainly from Italy. The Lemon is not so easily injured by cold as the citron, but is more tender than the orange or pomelo. The entire fruit, rind and pulp, is used extensively for culinary and confectionary purposes, for the manufacture of citric acid and for lemonade, etc. It is commonly prop. by seeds, but may also be readily grown from cuttings. The cultivated varieties must be prop. by budding or grafting, or by cuttings, as they do not come true to seed. The following are the most important horticultural varieties: Belair: Fr. lemon-shaped, blunt. Foreign.—Eureka: Fr. early, few-seeded: tree thornless. Foreign.—Genoa: Fr. medium size, early, oval, nearly seedless: tree everbearing, thornless. Foreign.—Lisbon: Fr. medium size, fine grained, strongly acid; few seeds: tree thorny. Foreign.—Villa Franca: Fr. medium size, quality excellent; rind smooth, thin; seeds few or none. One of the finest Lemons grown.—The so-called Fingered Citron or Lemon, var. **digitàta**, Risso (or var. *chirocarpa*), in which the individual carpels of the fruit are separated above, is an interesting and striking monstrosity. (See Fig. 482, which is taken from a Japanese fruit known locally as the Bushiukan.) The Florida Rough Lemon, or simply "Rough Lemon," as it is called, is a fruit of doubtful relationship. Its appearance suggests that it may be a hybrid between the Citron and Lemon. It is a strong, vigorous grower, and forms an excellent stock, in warm localities, for the various orange varieties. It is the best stock for the Bahia navel orange, usually increasing its fruitfulness.

481. Kumquat — Citrus Japonica (× ½).



482. Fingered Citron.

Var. **àcida**, Hook. (*C. Mèdica*, var. *Limétta* of trade catalogues, etc.). LIME. A bush or small tree, 10–20 ft. high: lvs. oval or elliptical, small, crenate or serrate; petiole wing-margined, but not as broadly so as in the sour orange and pomelo: fls. small, white or with a slight pinkish tinge without; petals normally 5, but often 4: fr. small, spherical, ovate or elliptical; rind thin, light lemon-yellow, bitter; pulp very sour and somewhat bitter, juicy. India. Extensively cultivated in the West Indies and Florida, where it has escaped from cultivation and grows abundantly wild, frequently forming dense thickets. B. M. 6745. The horticultural varieties commonly cultivated in the United States are: Mexican (West Indian): Fr. small, oblong. Escaped from cultivation in South Florida and the West Indies. Supposed to have been introduced from Mex.—Persian: Fr. larger than in the preceding; said to be of excellent quality. Introduced from Persia.—Rangpur (Mandarin Lime): Fr. resembling a mandarin orange in having easily removable rind and separable segments or carpels; said to be of excellent quality. Introduced from India.—Tahiti: Fr. large, early, nearly seedless, of fine quality: tree nearly thornless; prolific. Introduced from Tahiti. This is probably the most highly prized variety of Lime grown. Until recently, the Lime had been used mainly for the manufacture of lime juice, which had become a standard article of commerce, and citric acid. Recently, limeade has became very popular at the soda fountains throughout the country, and this use is so rapidly extending that in a few years it will doubtless make Lime-growing an important industry.

H. J. WEBBER.

CIVE (written also Chive). *Allium Schoenóprasum*, Linn., a perennial plant native to Europe and the northern borders of the U. S. and northward. See *Allium*. The leaves of Cive are used green as seasoning in soups, salads and stews; but, like other vegetables of this class, it is little known in America. Cive grows 6 to 8 inches high, making dense mats of narrow, hollow leaves, and blooming freely in violet-colored heads, which scarcely overtop the foliage. The plant makes an excellent permanent edging, and is worth growing for this purpose alone. It is easily propagated by dividing the clumps; but, like other tufted plants, it profits by having the stools broken up and replanted every few years. It rarely seeds. It thrives in any garden soil. The leaves may be cut freely, for they quickly grow again. L. H. B.

CLADÁNTHUS (Greek, *klados*, branch, and *anthos*, flower; alluding to the branching, which distinguishes this monotypic genus from Anthemis). *Compósitæ*. An annual, yellow-rayed herb, branched from the base in a forking manner. A flower terminates each branch, whereupon two new branches start from directly beneath the flower. Each of these is temporarily stopped by a flower, and so on. A free-flowering, hardy annual, requiring no special care.

proliferus, DC. (*Ánthemis Arábica*, Linn.). Annual: glabrous, 2–3½ ft. high: lvs. alternate, pinnately parted; lobes linear, trifid: fls. solitary, bracted. N. Africa, not Arabia. W. M.

CLADOTHÁMNUS (*klados*, branch, and *thamnos*, bush, from the Greek). *Ericàceæ*. Erect shrubs, with many virgate branches: lvs. deciduous, alternate, entire: fls. pink, terminal, 1–3, nodding; corolla divided to the base or nearly so into 5 oblong petals; stamens 10; capsule 5–6-celled. Two species in Pacific N. America, from Alaska to Washington. Hardy deciduous shrubs, with handsome, rather large, pink fls. in summer; rarely cultivated. They will probably grow best in peaty and sandy soil, in a half-shady position; prop. by seeds or by cuttings of soft wood under glass, and by layers.

C. pyrolæflòrus, Bong. Shrub, 4–10 ft.: lvs. nearly sessile, obovate-lanceolate, mucronulate, glabrous, pale green, 1½–2½ in. long: fls. solitary, with 5 separate petals, 1 in. across, Alaska. G.F. 10: 215.—*C. campanulàtus*, Greene. Lvs. smaller: fls. 1–3, with the petals united into a short tube. Washington.

Alfred Rehder.

CLADRÁSTIS (Greek, *brittle branch*). *Virgilia* of gardens. *Leguminòsæ*. Deciduous trees: lvs. alternate, odd-pinnate, with few, rather large, entire, short-stalked leaflets: fls. in long, often panicled racemes, white, papilionaceous; calyx campanulate, 5-toothed; stamens 10, free or connate only at the base: pod linear, compressed, with 3–6 seeds. Two species in N. Amer. and E. Asia. Hardy ornamental trees of medium size, with showy fls. and handsome foliage, turning bright yellow in fall. They thrive in almost any soil. Prop. by seeds, sown in spring, or by root cuttings, dug up in fall and kept in sand or moss, moderately moist and cool, until spring.

tinctòria, Raf. (*C. lùtea*, Koch. *Virgília lùtea*, Michx.). Tree, with yellow wood and smooth bark, sometimes 50 ft.: leaflets 7–9, oval or ovate, glabrous, bright green, 3–4 in. long: panicles loose, drooping, 10–20 in. long: fls. white, fragrant, over 1 in. long. June. Kentucky, Tennessee and N. Carolina. S.S. 3:119–20. Mich. Hist. Arb. III. 266. Gng. 2: 401; 5: 98. F.E. 8: 427. G.F. 1: 92.—One of the most beautiful flowering native trees, with wide, graceful head and a short trunk, well adapted as single tree on the lawn. Hardy north to New Eng. and Ont. The wood yields a clear yellow dye. Known as Yellow-wood.

Amurénsis, Koch (*Maáckia Amurénsis*, Rupr.). Tree, to 40 ft.: leaflets 7–11, elliptic- or oblong-ovate, rounded at the base, glabrous, 2–3 in. long: racemes erect, dense-fld., often panicled at the base, 4–8 in. long: fls. whitish, about ⅓ in. long. July, Aug. Manchuria. B.M. 6551.—Var. **Buérgeri**, Maxim., from Japan, has the lvs. pubescent beneath. Alfred Rehder.

CLÁRKIA (Captain Wm. Clark, companion of Lewis, explorer of the Rocky Mt. region). *Onagràceæ*. Herbs of western N. Amer., with alternate, mostly entire lvs. and showy fls. in the upper axils or in terminal racemes. Fls. regular, the calyx tubular, the petals 4, narrow at the base and entire or lobed, wide-spreading; stamens 8, the alternate ones shorter; stigmas 4, large: pod oblong or linear, 4-sided. Clarkias are hardy annuals of easy cult. They thrive in a warm, light soil, either fully exposed to the sun or in partial shade. Useful for low masses or for edgings; also for vases and baskets. They have been much improved by domestication.

A. *Petals entire, or at least not lobed.*

élegans, Dougl. (*C. neriifòlia*, Hort.). Fig. 483. From 1–3 ft. high in cult., glabrous or nearly so, the stems reddish and glaucous, simple or sparingly branched: lvs. broad-ovate to linear, remote-dentate: fls. purple or rose-colored, running into white vars.; double forms in cult.: claw of the petal about as long as its rhomboidal limb: capsule sessile. B.M. 3592. R.H. 1845:385. Mn. 1:22.—One of the commonest annual fls.

rhomboidea, Dougl. Not so tall and more slender: lvs. thin, lance-oblong or ovate-oblong, entire: claw often toothed, shorter than the rhomboidal limb: capsule stalked. R.H. 1864:151?—Perhaps not in cult.

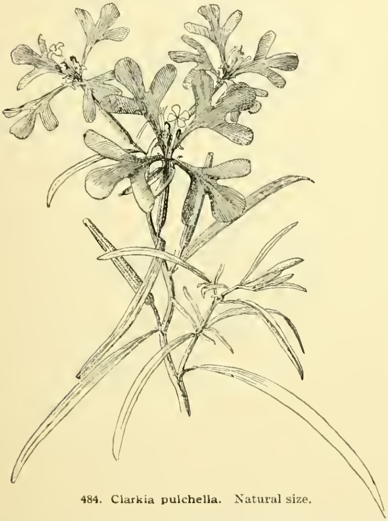
AA. *Petals deeply 3-lobed.*

pulchélla, Pursh. Fig. 484. One ft. to 18 in. high, branchy, often tufted and dwarf, the stems mostly puberulent: lvs. narrowly lance-oblong to linear, narrowed into a petiole, entire: fls. lilac, running into white vars.: capsule stalked. B. M. 2918. R. H. 1845:385; 1886, p. 557.—Common in cult. There are semi-double forms.

L. H. B.

483. Clarkia elegans.
Showing double flowers and the capsules (× ⅔).

CLARY. The dried lvs. of *Salvia Sclarea*, which are used for seasoning. Other species of Salvia have been used for the same purpose. See *Salvia*.



484. Clarkia pulchella. Natural size.

CLAYTÒNIA (after John Clayton, of Virginia, one of the earliest American botanists. From his collections Gronovius edited the Flora Virginica). *Portulacàceæ.* SPRING BEAUTY. Small, hardy, glabrous, succulent, perennial herbs, with slender, 2-leaved stems from a deep, globular corm, and loose racemes of white or rose-colored fls. with deeper veins, appearing among the first wild fls. and lasting only a few days. The genus has about 25 species, mostly N. Amer., and is characterized by its oval, persistent sepals and 5 stamens. Plants can be obtained from dealers in native plants. They can be naturalized in moist places, and do well in half-shady spots at the bottom of a rockery. For *C. parvifolia*, *parviflora* and *perfoliata*, see *Montia*.

Virgínica, Linn. Plant 4–8 in. long, often forcing an irregular way through the leaf-mold of damp, rich woods: lvs. linear-lanceolate or linear, 2–6 in. long, including the gradually tapering base: fls. larger and more numerous than in *C. Caroliniana*. Colo. to Atlantic and S. to Gulf. B.M. 941. L.B.C. 7:643. D. 33.

Caroliniàna, Michx. Lower and fewer-fld.: lvs. 1–2 in. long, oblong, oblong-lanceolate, or somewhat spatulate, with a blade 1–2 in. long, abruptly contracted into a marginal petiole. Minn. to Atlantic and S. to Mts. of North Carolina.

lanceolàta, Pursh. About 4 in. high: lvs. oblong or lanceolate, ½–1½ in. long, sessile, the base broad or narrow: raceme short-peduncled: petals emarginate or almost obcordate. Utah and Calif. W. M.

CLEISÓSTOMA (Greek, *closed mouth*, referring to the structure of the spur). *Orchidàceæ*, tribe *Vándeæ*. Epiphytes: stems leafy: lvs. coriaceous, flat or nearly terete: sepals and petals adnate to the column, spreading; labellum with a large saccate spur; column short, thick; pollinia 2. From eastern Asia and Austral. A genus comprising in this neighborhood 40 species, which suggest Saccolabium. The plants are little known in Amer. The leading species are *C. crassifolium*, Lindl., and *C. ringens*, Reichb. f. *C. Dawsonianum*, Reichb. f., is a Trichoglottis; *C. multiflorum*, Hort., is probably *Ærides multiflorum*.

OAKES AMES.

CLÉMATIS (Greek name of a climbing plant). *Ranunculàceæ.* Climbing vines, or erect or ascending perennial herbs, more or less woody: lvs. opposite, slender petioled, pinnately compound, lobed, or in some species entire: sepals usually 4 or 5, sometimes more, valvate in the bud, petaloid; petals none (or small in Atragene section); stamens many; pistils many; akenes in a head, 1-seeded; style persistent, long, plumose, silky or naked. Fig. 492. About 150 species of very wide geographical distribution, most abundant in temperate regions. About 20 species found native in North America.—Les Clematites, Alphonse Lavallée, Paris, 1884; referred to below by "Lav."—The Clematis as a Garden Flower, Thomas Moore and George Jackman, London, 1872; referred to below by "M. & J."—Clematises, Dr. Jules le Bele, in Bull. de la Societe d'Hort. de la Sarthe: republished in The Garden (vol. 53), June–Oct. 1898.—O. Kuntze, Monogr. der Gattung Clematis in Verh. Bot. Ver. Brandenb. 26 (1885).—A. Gray, Fl.N. Am. I: 4–9, 1895.

A rich soil of a light, loamy character is the best for Clematises, and a little mixture of lime will make it better. The soil must be well drained, and must be kept rich by at least annual applications of horse- or cow-manure. On dry, hot soils cow-manure is best, while on heavy soils a thorough dressing of rich leaf-mold would best serve the purpose. Mulching with half-rotted manure on the approach of winter tends to increase the strength of the plants and the size of the flowers. In dry seasons, spraying is always helpful during the growing season.

Clematises belonging to the Montana, Cærulea, Florida, and Lanuginosa types should be pruned in February or March, by cutting away all weak, straggling and overcrowded branches. The first three mentioned flower from the ripened wood; it is essential, therefore, that in order to secure blossoms, enough of the strong one-year-old wood should be retained. Viticella, Jackmani and Lanuginosa should be vigorously cut back, say in November; they blossom from the new shoots. Those of the Cærulea type should be pruned very little, soon after the flowers have disappeared, by simply trimming off useless branches and seed-bearing peduncles.

Clematises of the vigorous climbing varieties are used in many places to cover walls, root fences, mounds, arbors, balconies, trellises, small buildings, and, in fact, many other places the ingenious gardener will think of. For pot culture in the greenhouse, and for conservatory walls, the less vigorous species are best suited. All the many varieties and hybrids of the Cærulea and Lanuginosa types, including Henryi and the forms of Jackmani, are well adapted to this use, as well as for outdoor purposes. The dwarfer and more bushy species are used in greenhouses to some extent, but are found principally in borders or on large rockeries. Of the latter J. B. Keller says: "Their flowers are not so large as we see them in most of the climbers, yet they are indispensable in the flower garden, being prolific bloomers and free growers in ordinarily rich, deep garden soil. There is room for improvement in this class, however, and specialists who hitherto have done so much for the climbers, ought to direct their efforts now to the long-neglected bush Clematises. A noble beginning has been made, resulting in the large-flowering *C. integrifolia*, var. *Durandi*, but we expect more of them in the future." See special notes on culture and hybrid-forming qualities after the descriptions of some of the species and varieties.

The most common method of propagation is by grafting. Roots of *C. Flammula* or *C. Viticella* are used; the cions are taken from plants that have been grown under glass, and are used before the wood is entirely ripe. Cions taken from plants grown in the garden in summer are rarely successful. The grafts, in pots or trays, are grown in a moist coolhouse, over gentle bottom heat. Another method of propagation, involving less labor but usually successful, is to take cuttings of nearly ripe wood, grown under glass, and treat them as the cions first above mentioned, without the roots. The latter method is practiced preferably in summer in gentle hotbeds; shading, spraying, and later on airing, must be strictly attended to. Layering is practiced where large old stools are at hand. The knife is not used in the operation, but a twist of the stem will split the inner bark lengthwise. Every other joint is thus treated, pegged down, and covered with soil. It is best to leave the layers undisturbed until the following spring. Many of the species are often propagated by seed, and many new varieties have thus been formed. The number of hybrids is almost countless; in this account are carefully recorded all those in the American trade which are traceable to their origin.

The Clematis is subject to a very serious disease, due to the depredations of a nematode worm in the roots. This trouble is most serious under glass and alongside buildings where the ground does not freeze deep. The parasite is probably distributed in the soil adhering to pot-grown plants. It is probable that hard freezing kills the parasite. There is no remedy, so far as known, for affected plants. Using only soil which has been frozen is to be recommended to the propagator. K. C. Davis.

The hybrid varieties of Clematis, commonly known as the large-flowering sorts, are, when successfully grown, among the most beautiful of hardy climbing plants. The commercial propagation and growing of most of the large-flowering varieties, however, is attended with so many difficulties and disappointments that it has never been very generally attempted by nurserymen or florists in this country. At the present time there are scarcely half a dozen houses on this continent who attempt the propagation of Clematis to any considerable extent, and it is only within the past fifteen years that Clematises have been commercially grown even by this limited number. Prior to that, practically all of the large-flowering Clematis planted in this country were imported from Europe, the major part being supplied by Holland, whose moist atmosphere and black soil produces large, vigorous plants, but whose climatic conditions are so entirely different from those usually found in this country that the plants often failed to adapt themselves to their new surroundings, and did not thrive to the extent that their good size and vigorous condition seemed to give promise.

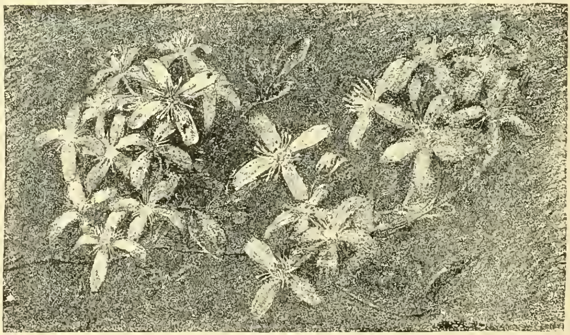
The propagation of Clematis throughout Europe is usually effected by grafting pieces of well-ripened, year-old wood upon roots of almost any of the more vigorous growing species, *Clematis Flammula* being most commonly used. In this country, on the contrary, the method commonly pursued is by means of cuttings from young wood, struck in sand, with gentle bottom heat, usually during May or June. So far as concerns the comparative vigor and desirability of plants produced by these two methods, there is small choice between them. It has been our experience that propagation by cuttings is, in this country, the more rapid and economical way, and, further, it removes the possibility, sometimes realized in grafted plants, of sprouts being thrown up from the roots, and, if in the hands of an uninformed amateur, entirely "running out" the variety grafted in.

Clematises hybridize so readily that the number of varieties resultant from various crosses forms a long list. But while so many have been dignified with names and places in the catalogues of nurserymen, yet the varieties of large-flowering Clematis that have proved so valuable as to secure permanent places for themselves in popular demand can almost be counted upon one's fingers. There are many varieties possessing most beautiful shades and variations of coloring that fail to attain popularity, chiefly on account of deficiency in two essential characteristics,—vigorous habit of growth and abundance of bloom. *Clematis Jackmani*, purple, originated in 1862, by Mr. George Jackman, was one of the first hybrid Clematises introduced, and still stands as the most popular, and, of its color, the most valuable variety yet known. The new variety, Madame Edouard André, a deep, rich crimson, is distinct and novel, being at this time the only large-flowering sort of a truly crimson shade. It is of fully as vigorous habit as the Jackmani, and its flowers are similarly massed, though not produced in quite such profusion. Clematis Madame Baron Veillard is another new and distinct variety that promises to prove a valuable acquisition. It is of exceedingly vigorous habit, and the flowers are quite freely produced, though, being more dispersed over the plant, they do not make so much of a show as do varieties whose flowers are closely massed. The flowers are of very large size and of a light rose color, shaded with lilac. Of white varieties, Henryi, Mrs. George Jackman and Lanuginosa Candida, all of them introduced long ago, still remain about the most desirable ones known. Ramona, deep sky-blue, is a variety which originated on our grounds some ten years ago. It is of extra large size, often 9 to 10 inches across, of very vigorous habit and free-flowering.

Of double-flowered varieties, Duchess of Edinburgh, white, is the best known in this country, and about the most desirable, though a new double white variety, called "Snowdrift," originated by the famous Luther Burbank, and now being propagated by us, promises to excel it in both floriferousness and vigor of growth. John Gould Veitch is a double sort with flowers of lavender-blue, but, with us at least, has seemed a shy bloomer and of weak habit. Mme. Grange (purplish violet), Star of India (purple), Velutine Purpurea (purple), and Viticella Venosa (reddish purple), are all desirable varieties.

Although they are in reality slightly less hardy than the Florida and Patens types, we would recommend for northern localities varieties of the Lanuginosa, Viticella and Jackmani types, which produce their flowers from young growing wood. Plants of these types, even if frozen back to the ground, will still produce a good show of flowers, since, as stated, they bloom from the young growing wood. Indeed, they need to be pruned back considerably anyway to induce a free growth of young wood. With plants of the Patens and Florida types, which blossom from year-old wood, a severe freezing back of the plants would destroy the crop of flowers for the year.

Of the small-flowering varieties, *Clematis paniculata* (white), introduced from Japan, has proved a wonderfully valuable acquisition in this country, and has already become exceedingly popular. It is of remarkably vigorous habit, often making a growth of 20 to 25 feet in a season. It seems thus far to be entirely free from



485. Spray of Clematis paniculata.

disease, is delightfully fragrant, and so floriferous that the blossoms form a dense sheet of bloom, remaining in full beauty for several weeks. The foliage is very thick and heavy, thus making it very desirable for covering porches and arbors.

Crispa (blue) and Coccinea (red) are varieties with very pretty, bell-shaped flowers. They are easily grown and do well in almost all situations.

The perennial, non-climbing varieties of Clematis are most pleasing border plants, succeeding well in all ordinary soils and making a rich show of bloom at their flowering season. Davidiana (blue) and Recta (white) are about the best known and most desirable varieties of this class.

To grow Clematis most successfully, they should be given a good depth of loamy soil, with a fair supply of well rotted manure spaded in and thoroughly distributed through the soil. In hot, dry weather, the plants should be regularly watered in order to obtain the greatest number of fls. possible, for the plants are very susceptible to injury by drought. A point of great importance, especially in caring for newly set plants, is to provide a firm support for them to climb upon. A solid wooden or metal trellis is preferable, for the reason that it prevents the plants from being whipped about by the winds, which often results either in breaking the stalks just above the ground or else in cracking the outer bark of the stalks and rendering them more liable to the attacks of insects and fungous diseases. Training the vines upon strings, or a pliable support of any kind, is not to be advised for this reason. Propagation of the hybrid varieties is effected both by cuttings and by grafts. All of the type varieties grow readily from seed.

Jackson & Perkins Co.

Index: alpina, 32; *aristata*, 9; aromatica, 29; *azurea*, 14. bicolor, 20; brevicaudata, 6; cærulea, 14; Californica, 8; campaniflora, 19; candida, 12; Catesbyana, 7; cirrhosa, 15; coccinea, 21; Columbiana, 31; crassifolia, 9; crispa, 22; Davidiana, 25; Douglasi, 26; Drummondi, 3; *erecta*, 1; eriostemon, 18; excelsior, 12; Flammula, 2; floribunda, 19; florida, 20; Fortunei, 20; Fremonti, 27; fulgens, 18; grandiflora, 14, 15; *graveolens*, 11; Hendersoni, 18; Henryi, 12; heracleæfolia, 25; Hookeri, 25; indivisa, 17; integrifolia, 28: Jackmani, 12; Kermesinus, 18; lanuginosa, 12; ligusticifolia, 8; lilicinafloribunda, 18; marmorata, 18; Meyeriana, 10; modesta, 18; montana, 15; nivea, 12; occidentalis, 32; ochroleuca, 30; *odorata*, 15; orientalis, 11; paniculata, 5; *patens*, 14; Pieroti, 16; Pitcheri, 24; purpurea-hybrida, 18; recta, 1; reticulata 23; rubella, 2: Sargenti, 24; *Sibirica*, 32; Sieboldi, 20; Standishii, 14; Stanleyi, 13; stans, 25; *tubulosa*, 25; Tunbridgensis, 12; verticillaris, 31; Viorna, 21; Virginiana, 7; Vitalba, 4; Viticella, 18.

A. *True petals none; sepals petaloid. Clematis proper.*

B. *Styles of fruit very long and plumose (Fig. 492).*

C. *Fls. on the new growth, numerous, small, appearing in the last half of the season, often in panicles. Flammula section.*

D. *Herbaceous, nearly erect.*

1. **récta**, Linn. (*C. erécta*, Linn.). Herbaceous, somewhat tufted, 2–3 ft. long: lvs. pinnate; lfts. stalked, ovate, acuminate, entire: fls. numerous, on a large, branching, terminal corymb; white, sweet-scented, 1 in. across. June–Aug. S. Eu. Gn. 52, p. 510; 53, p. 547.—Var. **plèna**, Lemoine. Fully doubled, button-like blossoms.

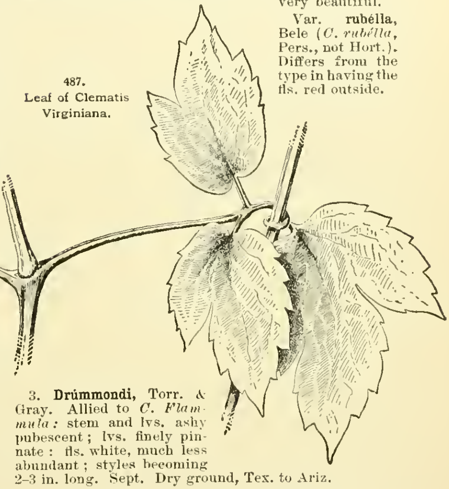
486. Flower of Clematis paniculata. Natural size.

DD. *Woody or half-woody, climbing.*

E. *Fls. usually perfect, nearly white.*

2. **Flámmula**, Linn. (*C. Pállasi*, J. F. Gmel.). A slender but vigorous climber, reaching 10–15 ft.: dark green lvs., remaining fresh till midwinter; lfts. variable but usually bipinnate, small, ovate, oblong or linear: fls. small, numerous in axillary and terminal panicles; sepals 4, linear-oblong white; stamens white; fr. bearing white plumes. Aug.–Oct. Mediterranean region. Gn. 52, p. 499.—Must have a sunny exposure; very beautiful.

Var. **rubélla**, Bele (*C. rubélla*, Pers., not Hort.). Differs from the type in having the fls. red outside.



487. Leaf of Clematis Virginiana.

3. **Drúmmondi**, Torr. & Gray. Allied to *C. Flammula*: stem and lvs. ashy pubescent; lvs. finely pinnate: fls. white, much less abundant; styles becoming 2–3 in. long. Sept. Dry ground, Tex. to Ariz.

4. **Vitálba**, Linn. In Europe called Traveller's Joy. The most vigorous climber of the genus, ascending 20–30 ft.: lvs. pinnate; lfts. ovate-lanceolate, acuminate, cordate at the base, partly cut: fls. numerous, in axillary panicles, dull white, ¾ in. across, with a faint odor of almonds: styles of fr. long and feathery, from which it is given the name Old Man's Beard. July–Sept. Eu., N. Afr., Caucasus region. Gn. 53, p. 546. S.H. 2:540.

5. **paniculàta**, Thunb. Figs. 485 486. A vigorous climber: lfts. 3–5, often lobed, acuminate, 1–4 in. long, glabrous: fls. fragrant, 1–1½ in. across, in axillary and terminal panicles; sepals 4, dull white. Sept. Japan. G.F. 3:621; 5:91; 9:75 and 185. F.R. 2: 581. Mn. 7:113; Gng. 1:101 and 165; 6:291; 4:229. A.F. 13:1314.—Prop. by seed. By far the most common of the fall-blooming species in American gardens. Thrives best in sunny situations.—Will stand severe pruning in winter.

6. **brevicaudàta**, DC. (*C. brevicordàta*, Hort.). Climbing vigorously: lvs. pinnate to bipinnate; segments ovate-lanceolate, acuminate, coarsely toothed, nearly glabrous: fls. in axillary panicles, white. Aug.–Oct. China. G. F. 5:139.—Very little used.

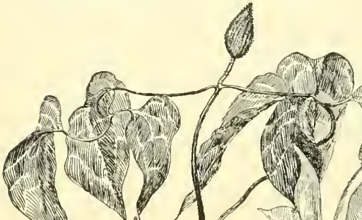
EE. *Fls. monœcious or diœcious, white or whitish.*

7. **Virginiàna**, Linn. Fig. 487. Climbing 12 to 15 ft.: lvs. ternate; lfts. glabrous, cut-toothed, bases often cordate: fls. white, in leafy panicles, often monœcious or diœcious, about 1 in. across when expanded: plumose styles 1 in. or more in length. July–Sept. Nova Scotia to Ga., westward to Kans. G.W.F.A. 12. D. 103.

Var. **Catesbyàna**, Britton (*C. Catesbyàna*, Pursh). Lvs. somewhat pubescent, often biternate. S. E. states. Fl. 736 (1814). Int. 1883.

8. **ligusticifòlia**, Nutt. Allied to *C. Virginiana*, but having 5–7 lfts., of firmer texture, rather more pubescent, variable in form and margin, but usually 3-lobed or coarsely toothed: fls. white, ¾ in. across, in terminal and axillary panicles; styles densely silky-pubescent, with long, straight hairs. Aug. Missouri to N. Mexico and Brit. Columbia. Int. 1881. Var. **Califórnica**, Wats., has no marked difference: lvs. usually smaller and perhaps more tomentose.

9. **crassifòlia**, Benth. Climbing: lvs. coriaceous, 3-parted; segments nearly entire, ovate-acuminate, with bases cuneate: fls. in small, axillary panicles; sepals 4, spreading, dull or white; anthers shorter than the filaments. Late summer. China.—Suitable for greenhouse use, but not yet well introduced. *C. aristata*, of B. R. 3:238, is a fair representation of this plant.



488. Clematis Henryi. One-fourth size.

10. **Meyeniàna**, Walp. Climbing rapidly, more hardy than *C. crassifolia:* lvs. much the same, but with the segments obtuse or cordate at the base: fls. much as in that species, but with the anthers longer than the filaments. Late summer. China.

EEE. *Fls. perfect, yellow, and more spreading than the preceding.*

11. **orientàlis**, Linn. (*C. gravèolens*, Lindl.). A rapid climber, reaching 12–15 ft.: lvs. thin, glaucous and shiny, twice or thrice ternate; lfts. 3-parted or -lobed, with small, ovate, entire or cut-toothed divisions: fls. solitary, becoming erect or nearly so, 1½ in. across; sepals 4, yellow, tinted with green, somewhat reflexed; styles plumose. Aug.–Sept. Himalaya region. Lav. 21. Figured as *C. graveolens* in the following: B.M. 4495. Gn. 45:954, p. 240. F.S. 4:374 b; 6:548.

CC. *Fls. on the new growth, appearing successively throughout the summer.*

D. *Climbing plants.*

12. **lanuginòsa**, Lindl. (including var. *pállida*, Hort.). Climbing only 5 or 6 ft.: lvs. simple or of 3 lfts., cordate-acuminate, woolly beneath: fls. erect, woolly in the bud, the largest of the wild species, being 6 in. across; sepals 5 or 6, broadly ovate, leathery, rather flat, overlapping, lavender or bluish gray; center of stamens pale reddish brown; styles plumose. Summer. Native near Ningpo, China. F.S. 8:811. I.H. 1:14. Lav. 1. M. & J. 4.—It is to this species, more than to any other, that the beauty and popularity of the garden varieties and hybrids are due. The finest hybrids, including *C. Jackmani* and its section, and *C. Henryi*, contain more or less of the blood of *C. lanuginosa*.

Var. **cándida**, Lemoine (*C. cándida*, Hort.). Like the type, except that the simple lvs. and lfts. of the compound lvs. are much larger, and the fls. are larger, being 7–8 in. across.—Perhaps a hybrid of *C. cœrulea*.

Var. **nivea**, Lemoine (*C. nivea*, Hort.). Sepals 6–8, narrowish, pure white: anthers pale brown.—Thought to be of the same origin as the above var.

Other forms of *C. lanuginosa* are:

Lady Caroline Nevill (C. Lady Caroline Nevill, Hort.). Fls. often 7 in. across; sepals 6, nearly white, with mauve-colored stripe down center of each. Gn. 46 p. 33.—One of the finest light-colored varieties.

Marie Lefebvre (C. Marie Lefebvre, Hort.). Resembles the last, but has 8 sepals, more pointed, and darker in shade.

Sensation (C. Sensation, Hort.). Fls. like the type, but with 6–7 grayish blue sepals; fls. 6 in. across.

Madame Van Houtte (C. Madame Van Houtte, Hort.). Late-blooming; sepals pale blue, becoming white.

Madame Thibaut (C. Madame Thibaut, Hort.). Fls. very abundant.—Thought to be a hybrid with C. Viticella.

The President (C. The President, Hort.). A rich violet-blue flower.

Excelsior (C. Excelsior, Hort.). Fls. double; sepals grayish purple, with a reddish bar down the center of each. F.S. 20:1995.

Of the more certain hybrids of this group, some of which are so closely allied to *C. lanuginosa* as to be considered varieties of it, the following are the best in the American trade:

E. *Fls. white or whitish.*

Gloire de St. Julien, Carre. (× C. cærulea, var. plena). Plant, much like C. lanuginosa, but with larger fls.; sepals 6–8, white or pale gray at first; stamens yellow.

Hénryi, Anderson-Henry (×C. florida, var. Fortunei). Fig. 488. Robust plant: free bloomer; fls. creamy white, becoming fully expanded when grown in the open sun or under glass. Aug.–Nov.—It resembles more the lanuginosa parent.

Otto Frœbel, Lemoine (× C. cærulea). Lvs. leathery, simple or 3-parted: fls. of fleshy texture, grayish white, sometimes becoming bluish; sepals 8, blunt, broad; anthers brownish.

Imperatrice Eugenie, Carre. (C. l. var. pallida × C. cærulea). Lvs. simple or 3-parted; lfts. broad and woolly: fls. 8–9 in. across, with 8 broad, white sepals.

Jeanne d'Arc, Dauvesse. Same cross as last and much like it, but the sepals are grayish white, with 3 blue bars down the center of each.

EE. *Fls. some shade of blue, lavender, purple, etc., except in some vars. of C. Jackmani.*

Lawsoniána, Anderson-Henry (× C. florida, var. Fortunei). Fls. very large; sepals 6–8, broad, rose-purple, marked with darker veins. Aug.–Nov.

rubro-violàcea, Jackman (× C. Viticella, var. atrorubens). Lvs. pinnate, with ovate-acuminate or sometimes ovate-lanceolate lfts.: sepals 4–6, maroon-purple; stamens greenish. F.S. 16:1630. F.M. 1876:217. Var. *Prince of Wales*, Hort., has fls. of lighter tint.

La France, Hort. (× C. Jackmani). Lvs. smooth: buds woolly; sepals deep cobalt-blue, pointed, with wavy edges.

Reine des Bleues, Boisselot (same cross as the last). Fls. large, blue, with broad, recurved sepals.

Devoniénsis, Hort. (same cross). Fls. 8–9 in. across; sepals 8, delicate lavender-blue. Gn. 9, p. 563 (note).

Symesiána, Anderson-Henry (× C. florida, var. Fortunei). Fls. 7 in. across; sepals 6–8, pale mauve; a profuse bloomer.

Gem, Baker (× C. Standishi). Lvs. 3-parted or simple: fls. like C. lanuginosa in form: grayish blue.

Jáckmani, Jackman (× C. Hendersoni, 1858–60). Habit and lvs. of C. lanuginosa: fls. flat, 5–6 in. broad; sepals 4–6, very broad, velvety purple, with a ribbed bar down the center; broad, central tuft of pale green stamens. M. & J. 5, 6, 9, 10, 11, 12, 14. I.H. 11:414. F.S. 16:1629. Gn. 22:349; 53, p. 262. A.G. 19:269. A.F. 10:1329. R.H. 1868:390. Var. *alba*, Hort. Fls. nearly pure white. Gn. 25:427. Var. *supèrba*, Hort. Fls. violet-purple, resembling C. Madame Grangé. See Fig. 489.

Other hybrids or varieties of *C. Jackmani* are: Var. *Gipsy Queen*, Cripps (C. Gipsy Queen, Hort.), deep violet. Var. *Alexándra*, Jackman (C. Alexandra, Hort.), reddish violet. Var. *Star of India*, Cripps (C. Star of India, Hort.), 5 in. across, purple, barred with red. Var. *Tunbridgénsis*, Cripps (C. Tunbridgensis, Hort.), reddish purple, barred with light blue. Var. *magnifica*, Jackman (C. magnifica, Hort.), rich purple, shaded with crimson, 3 bars of red in each sepal. Var. *Madame Grangé*, Hort. (C. Madame Grangé, Hort.), sepals very concave, purple crimson. Var. *Mrs. James Bateman*, Noble (C. Mrs. James Bateman, Hort.), pale lavender; a probable cross of C. J. with C. lanuginosa; M. & J. 2, f. 1; F.S. 29:1779. Var. *Mrs. Moore*, Jackman (C. Mrs. Moore, Hort.), 8–9 in. across, sepals rather narrow, white. Var. *Thomas Moore*, Jackman (C. Thomas Moore, Hort.), as large as the last, rich violet, with white stamens. Var. *Madame Baron Veillard*, Baron Veil. (C. Madame Baron Veillard, Hort.), rose-lilac. Var. *Madame André*, Baron Veil. (C. Madame André, Hort.), carmine-violet. R.H. 1893:180. Var. *velutina-purpurea*, Jackman (C. velutina-purpurea, Hort.), fls. 4–6 in. across, usually 4, sometimes 5 or 6 sepals, blackish purple.

DD. *Herbaceous, erect.*

13. **Stánleyi**, Hook. (*C. Stanleyàna*, Hort.). Erect, robust herbs, 3 ft. high: lvs. biternate; lfts. sessile or petioled, variable in size, cuneate, silky: fls. 1–3 in. across, white to pink-purple; sepals becoming widely expanded; stamens yellow; styles becoming very plumose, white. July–Oct. Transvaal. Int. 1893. B.M. 7166. Gn. 39:789. G.F. 3:513. G.C. III. 8:327.—Suitable for greenhouse culture; in the northern states it is apt to winter-kill if left unprotected.

CCC. *Fls. on the year-old ripened wood, appearing in late winter, spring, or early summer.*

D. *Sepals more than 4, usually 6–9.*

14. **cærùlea**, Lindl. (*C. pàtens*, Morr. & Decne. *C. azùrea*, Hort., ex. Turcz.). Taller and more slender, and lfts. smaller and narrower than *C. lanuginosa*: fls. spreading; sepals about 8, rather narrow, delicate lilac; stamens purple. Spring. Isle of Nippon, Japan. M. & J. 3. Lav. 2 and 3. B.R. 23:1955. P.M. 4:193. B. 3:126.—Should be grown on a northern exposure to preserve the color of the flowers. It is almost as prolific as *C. lanuginosa* in producing garden varieties and hybrids, and it is the most likely of all to produce double-flowered forms.

Var. **grandiflòra**, Hook. (*C. azùrea*, var. *grandiflòra*, Hort.). Fls. larger than the type. B.M. 3983.

Var. **Stándishi**, Moore (*C. Stándishi*, Hort.). Fls. about 5 in. across; sepals light purple, of metallic luster.—A fine variety from Japanese gardens.

The following other garden varieties:

Mrs. James Baker (C. Mrs. James Baker, Hort.). Sepals nearly white, ribbed with dark carmine,

Miss Bateman, Noble (C. Miss Bateman, Hort.). Fls. more compact than the type, 6 in. across; sepals ovate, shortly acuminate, pure white, with cream-colored bars; anthers brown. Probably of hybrid origin; allied to var. Standishi.

Stella, Jackman (C. Stella, Hort.). Fls. not so large as the last; sepals deep mauve, with a red bar down the center of each. F.S. 22:2341.

Amalia, Siebold (C. Amalia, Hort.). Sepals 6 or more, oblong-lanceolate, light lilac. From Japanese gardens. F.S. 10:1051.

Lord Lanesborough, Noble (C. Lord Lanesborough, Hort.). Sepals bluish lilac, each with a metallic purple bar.—A good variety to gradually force to blossom in the greenhouse by March.

Lady Lanesborough, Noble (C. Lady Lanesborough, Hort.). Sepals silver-gray, the bar being lighter colored.—It will blossom in March in the greenhouse.

Marie, Simon-Louis (C. Marie, Hort.). Fls. darker than the type.

The Queen, Jackman (C. The Queen, Hort.). Fls. rather compact, the sepals being broader than the type.

John Murray, Jackman (C. John Murray, Hort.). Habit and foliage bolder than the type: fls. somewhat later. Gn. 46:970.

Fair Rosamond, Jackman (C. Fair Rosamond, Hort.). Sepals apiculate, broader than the type, and of the same color. F.S. 22:2342.

Countess of Lovelace, Jackman (C. Countess of Lovelace, Hort.). Fls. double, blue-violet; sepals much imbricated. In the second crop of blooms the fls. are single, as is often the case in other double varieties.

Albert Victor, Noble (C. Albert Victor, Hort.). Fls. much like the type, but large and more compact.—Suitable for forcing under glass.

Duchess of Edinburgh, Jackman (C. Duchess of Edinburgh, Hort.). Fls. double, white, strongly imbricated.

Louis van Houtte, Hort. (C. Louis van Houtte, Hort.). Semi-double, rosy white.

Vesta, Endlicher (C. Vesta, Hort.). Sepals gray; anthers red. Gt. 39:1333. Gn. 9:18.

Helena, Siebold (C. Helena, Hort.). Fls. pure white, with yellow stamens. F.S. 11:1117. I.H. 1:21.

monstrosa, Van Houtte (C. monstrosa, Hort.). Fls. semi-double, pure white. F.S. 9:960.

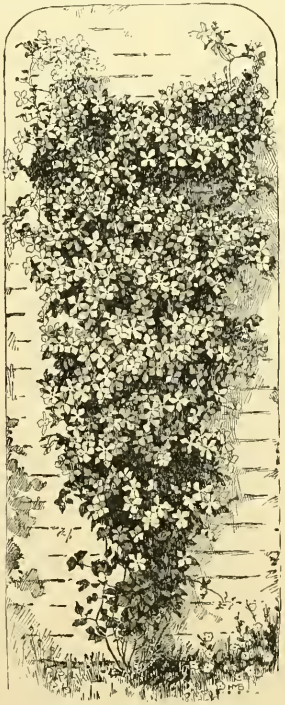
Sophia, Siebold (C. Sophia, Hort.). Sepals deep lilac-purple on the edges, with light green bars. F.S. 8:852. I.H. 1:21. B.H. [illegible]:97.

DD. *Sepals 4.*

15. **montàna**, Buch.-Ham. (*C. odoràta*, Hort., not Wall.). A vigorous climber, often reaching a height of 15–20 ft.: lvs. ternate, with oblong-acuminate cut-toothed lfts.: fls. several in each axil, following each other in succession of time, resembling white anemone blossoms, sweet-scented; sepals 4, elliptic-oblong, 1 in. long, spreading, becoming pink; stamens conspicuous, yellow. May. Himalaya region. B.R. 26:53. M. & J. 8. Gn. 49, p. 39; 51, p. 349. A.G. 19:391. R.H. 1856:161.—The species prefers a mild climate. The section of Clematises to which it belongs includes the evergreen forms, such as *C. cirrhòsa*, Linn., of the Mediterranean region.

Var. **grandiflòra**, Hort. Fls. 3–4 in. across. B.M. 4061.

16. **Pieròti**, Miq. Closely allied to the last: lvs. and lfts. shaggy-hairy, much toothed, veins prominent: fls. small. Early summer. Japan.



489. Clematis Jackmani, var. alba.

17. **indivisa**, Willd. Much like *C. montana*: fls. white; requires cool greenhouse culture, and is then very beautiful: lvs. evergreen. G.F. 6:167. A.F. 13:879. Gn. 53, p. 546.—*Indivisa*, var. *lobàta*, Hook., differs very little from the type. B.M. 4398. R.H. 1853:241. Gn. 53 p. 547. F.S. 4:402.

BB. *Styles of fr. usually rather short, often becoming plumose, but not so much as in B.—Viticella Section.*

C. *Climbing plants.*

D. *Fls. large, expanded when mature.*

18. **Viticélla**, Linn. Climbing 8–12 ft.: lvs. sometimes entire, but usually divided into 3 nearly entire lfts.: fls. 1½–2 in. in diam., growing singly on peduncles; sepals 4, blue, purple or rosy purple, obovate, pointed, reflexed; stamens yellow: fr. with rather short tails, devoid of plumes. June–Aug. S. Eu. to Persia. R.H. 1860, p. 183; 1876:110; 1879:350 (vars.). B.M. 565. Lav. 7.—This is the type of one of the leading groups of garden Clematises, and is one of the parents of the Jackmani type of hybrids.

The four following are garden varieties:

Kermesìnus, Hort. (C. Kermesinus, Hort.). Fls. of bright wine-red color, purple being absent. Gn. 39:787.

Lilicìna-floribùnda, Hort. (C. lilicina-floribunda, Hort. C. floribunda, Hort.). Fls. pale gray-lilac, conspicuously veined. Gn. 18, p. 389 (note).—An abundant bloomer. Produced in an English garden in 1880.

Lady Bovill, Jackman (C. Lady Bovill, Hort.). Fls. cup-formed, sepals being concave and little or not at all recurved at the ends, fls. 4 in. across; sepals 4–6, grayish blue; stamens light brown. M. & J. 15.

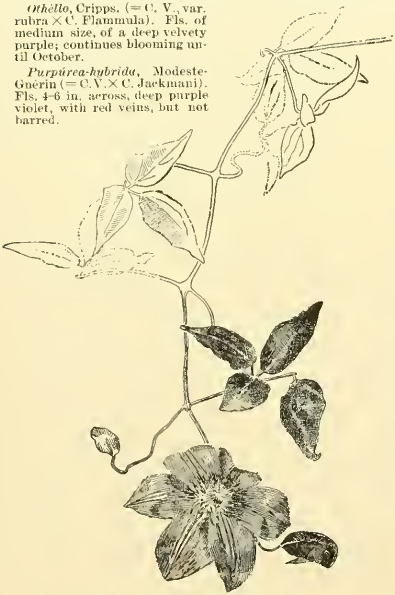
Marmoràta, Jackman (C. marmorata, Hort.). Fls. rather small, with 4 broad sepals, grayish blue, 3 longitudinal bars. M. & J. 1, f. 2; same plate in F. S. 20:2008 (opp. p. 17)

Hybrids of *C. Viticella* which are closely allied to that type:

Hèndersoni, Henderson (C. eriόstemon, Dcne. = C. V. × C. integrifolia). Stem and habit of C. Viticella: lfts. and fls. much like C. integrifolia: climbing 8–10 ft.: 4 blue sepals, spreading, reflexed at the tips. R.H. 1852:341. F.S. 13:1364 (as var. venosa).

Othèllo, Cripps. (= C. V., var. rubra × C. Flammula). Fls. of medium size, of a deep velvety purple; continues blooming until October.

Purpùrea-hybrida, Modeste-Guérin (= C. V. × C. Jackmani). Fls. 4–6 in. across, deep purple violet, with red veins, but not barred.



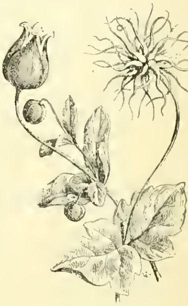
490. Clematis florida, var. bicolor.

Modesta, Modeste-Guérin (= C. V. × C. lanuginosa). Fls. well expanded, large, bright blue, bars deeper colored.

Fulgens, Simon-Louis (= C. V., var grandiflora × C. lanuginosa). Sepals 5–6, rather narrow, dark purple to blackish crimson, velvety, edges somewhat serrate.

Boskoop, Hort. (C. Boskoop Seedling, Hort. = C. V. × C. integrifolia). A new race in 1892: growing 3–5 ft.: fls. blue, lavender, rose or reddish rose.

19. **campaniflòra**, Brot. Climbing 10–15 ft.: fls. reflexed and bell-shaped as in the above type or more so; purple or whitish. June, July. Native of Portugal. L.B.C. 10:987. Lav. 8.—This has been called *C. Viticella* because of its close resemblance in flower, fruit and leaf; but the lvs. are often twice ternate, and the plant is much more slender in habit.



491. Clematis Viorna.

20. **flórida**, Thunb. A slender plant, climbing 9–12 ft.: lvs. variable, more or less ternate or biternate; lfts. small, ovate-lanceolate: fls. 2–4 in. across, flat when expanded; the 5–6 broad, ovate sepals creamy white, barred with purple beneath; stamens purplish. May, June. Japan. B. M. 834. R.H. 1856:41.

Var. **bicolor**, Steud. (*C. Sièboldi*, D. Don). Fig. 490. Like the type, but with the purple stamens somewhat petal-like, and forming a dense, purple head in the center. F. S. 5:487. Lav. 5. M. & J. 16. B. R. 24:25. P.M. 4:147. Gn. 22:349. R. H. 1856:401.

Var. **Fórtunei**, Moore (*C. Fórtunei*, Hort.). Fls. large, very much doubled; sepals creamy white, becoming pink. F. S. 15:1553. G. C. 1863:676. I. H. 10, p. 86. M. & J. 13.

Belle of Woking (C. Belle of Woking, Hort.). A hybrid form: fls. very full and double; sepals purple.

John Gould Veitch (C. John Gould Veitch, Hort. C. Veitchii, Hort.). Fls. velvet, double, resembling var. Fortunei, except in the color of the sepals. From Japanese gardens. F.S. 18:1875–6.

DD. *Fls. smaller, pitcher-shaped or tubular.*

21. **Viórna**, Linn. Fig. 491. Climbing 8–10 ft.: lvs. not glaucous nor coriaceous; lfts. subcordate-ovate to ovate-lanceolate, slightly reticulated: fls. solitary, on long peduncles, pitcher-shaped; sepals 4, 1 in. long, variable in color, often dull purple, thick and leathery, tips often recurved; styles plumose when mature. June–Aug. Penn. to Alabama and westward. Lav. 17.

Var. **coccinea**, A. Gray (*C. coccínea*, Engelm.). Lvs. glaucous, subcoriaceous; lfts. broader than the type, often obtuse or retuse: sepals carmine or scarlet. Texas. Lav. 19 (as *C. Texensis*). B.M. 6594. Gn. 19:275. Gt. 32:86. R. H. 1878:10; 1888:348.—Much superior to the type, because of its beautiful flowers. Some of the garden forms of this variety, which have probably been produced by crossing it with hardier Clematises, are found under the names: *Countess of Onslow*, deep scarlet, G.C. III. 16:9; *Countess of York*, white, tinted with pink; *Duchess of Albany*, clear pink, Gn. 52:1140.

22. **críspa**, Linn. A slender climber, reaching 3–4 ft.: lvs. very thin; lfts. 3–5 or more, variable in outline and sometimes undivided, often 3–5-lobed: fls. purple, varying to whitish, cylindrical or bell-shaped, 1–2 in. long; points of sepals recurved: styles of fr. hairy but not plumose. June–Sept. Virginia to Texas. B. R. 32:60. Lav. 14.—This and the allied species are fragrant.

23. **reticulàta**, Walt. A slender climber, allied to the last: lvs. much reticulated and very coriaceous: fls. solitary in the axils of the lvs., nodding, bell-shaped; sepals recurved, crispy at the margin: mature fr. with plumose tails. June, July. S. Car. to Ala. and Fla. B. M. 6574; 1892 (as *C. crispa*); 1816 (as *C. cordata*). Lav. 16.

24. **Pitcheri**, Torr. & Gray. Lvs. of 3–4 pairs of lfts. and a terminal lft. reduced almost to a midrib; lfts. coarsely reticulated: fls. 1 in. long and ¾ in. in diam., with swollen base; sepals dull purple, recurved at the tips: akenes pubescent, styles not plumose. June–Aug. S. Ind. to Mo., southward to Mex. Lav. 15.

Var. **Sárgenti**, Lavallée (*C. Sárgenti*, Hort.). Fls. smaller. Lav. 18.

CC. *Herbaceous, erect, or somewhat climbing in case of C. aromatica.*

D. *Sepals some shade of blue.*

25. **heracleæfòlia**, DC. (*C. tubulòsa*, Hook.). Stout, erect, woody only at the base: lvs. ternate, large, bright green; lfts. mucronately toothed: fls. numerous in corymbs, either axillary or terminal, tubular in form, with 4 light blue sepals, becoming reflexed; peduncles and pedicels downy; recurved stigmas club-shaped. Aug.–Sept. China. M. & J. 17. B. M. 4269; 6801 (as var. *Hoókeri*). P.M. 14:31. F.S. 3:195.—Prop. by root division.

Var. **Davidiàna**, Bean (*C. Davidiàna*, Decne.). About 4 ft. high, hardly strong enough to stand without support: lvs. larger than any other cultivated Clematis: fls. in clustered heads, 6–15 together, and also singly or clustered in the leaf axils. R.H. 1867, p. 90. Gn. 49, p. 99.

Var. **stáns**, Hook. (*C. stáns*, Sieb. & Zucc.). Herbaceous, non-climbing, 4–5 ft. long: lvs. pubescent: fls. less dense than the above variety, in terminal panicles and in close clusters in the leaf-axils, tubular in form; the blue sepals revolute from near the middle. Sept.–Oct. Jap. B.M. 6810.—Used chiefly because of the striking foliage and its late-blooming qualities.

26. **Doùglasi**, Hook. Has habit of *C. integrifolia*, about 2 ft. high: stem and petioles angled and ribbed: lvs. twice pinnately or ternately compound; lfts. narrow-linear or lanceolate: fls. tubular or bell-shaped, 1 in. long; sepals recurved, deep purple within, paler without. June. In Mts., Montana to N. Mex.—Int. 1881.

27. **Frèmonti**, Watson. Closely allied to *C. ochroleuca*, but with lvs. 3–4 in. long, nearly sessile, either entire or with a few coarse teeth: fls. often drooping; sepals thick, purple, nearly glabrous, except the tomentose edges; styles when young downy rather than feathery. July–Aug. Mo. to Colo. G. F. 3:381.

28. **integrifòlia**, Linn. Herbaceous, erect, becoming 2 ft. high: lvs. rather broad, entire, ovate-lanceolate: fls. solitary, nodding; sepals 4, rather narrow, blue, coriaceous, 1–2 in. long. June–Aug. Eu. and Asia. B.M. 65. Var. **diversifòlia**, Hort. Lvs. sometimes divided. Var. **Durándi**, Hort. (*C. integrifolia × lanuginosa*). Taller and fls. larger than in the type; sepals recurved. Gn. 49:1052. Gng. 5:276.—Very beautiful.

29. **aromática**, Lenné & C. Koch (*C. cærùlea*, var. *odoràta*, Hort.). Slender, herbaceous or somewhat climbing, reaching 6 ft. high if supported: lvs. of 3–7 ovate, nearly entire lfts.: fls. solitary, terminal, very fragrant, 1½–2 in. across; sepals 4, spreading, reflexed, reddish violet; stamens white. July–Sept. Nativity, perhaps, S. France. It is thought by some to be an old garden hybrid of the Viticella type, or *C. integrifolia × C. recta*, or *C. Flammula × integrifolia*. R. H. 1877, p. 15.

DD. *Sepals yellow.*

30. **ochroleùca**, Ait. Herbaceous, 1–2 ft. high, silky-pubescent, becoming glabrate: lvs. ovate, entire: fls. erect, solitary, terminal; sepals yellow outside, cream-colored within: styles becoming somewhat plumose. July–Aug. Dry grounds, N. Y. to Ga. L.B.C. 7:661.—Int. 1883.

492. Akene of Clematis verticillaris.

AA. *True petals small, spatulate; sepals petaloid; involucre none. Atragene section.*

31. **verticillàris**, DC. Fig. 492. Trailing or sometimes climbing, 8–10 ft.: usually 4 trifoliate lvs. from each node; lfts. thin, ovate, acute, toothed or entire, somewhat cordate; fls. solitary, blue or purple, nodding at first, 2–4 in. broad when expanded; 4 thin sepals, silky along the margins and veins; petals ½–¾ in. long. May–June. Woodlands, Va. to Hudson Bay, west to Minn. B.M. 887 (as *Atragene Americana*).—Int. 1881.

Var. **Columbiàna**, Gray. Sepals narrower and more pointed than in the type. Rocky Mts.

32. **alpina**, Mill. (*Atragene alpina*, Linn.). Stems 3–5 ft., slender, with prominent joints becoming swollen with age: lvs. once or twice ternate, with ovate or ovate-lanceolate lfts., serrate or incised: many petal-like stamens, which are devoid of anthers: sepals 4, bright blue. Spring. Northwestern N. Amer., Siberia to south and central Eu. B.M. 530 (as var. *Austriaca*). Gn. 46:982.—A very hardy climber, preferring a northern exposure.

Var. **álba**, Hort. (*Atragene Sibírica*, Linn.). Fls. white or nearly so. B.M. 1951.

Var. **occidentàlis**, Gray. Petal-like stamens very few, and often bearing rudimentary anthers. Rocky Mts.

The following are well worthy of cultivation, but are not at present found in the American trade: *C. Addisoni*, Britton. More bushy and less spreading than C. Viorna. G. F. 9:325.—*C. æthusæfòlia*, Turcz. Bushy; fls. tubular, white. Gn. 45:241. R.H. 1869, p. 10. B.M. 6542 (var. latisécta, Hook.).—*C. apiìfolia*, DC. Allied to C. Virginiana: lfts. smaller and narrower, coarsely incisely-serrate, often 3-lobed or serrate, pubescent beneath. Japan. Graceful species, hardy.—*C. barbellàta*, Edgew. Differs from C. montana mainly in wanting the involucre. Himalaya region. R.H. 1858, p. 407. B.M. 4794. F.S. 9:956.—*C. cirrhòsa*, Linn. Allied to C. montana. Fls. greenish white, yellow, or red, bell-shaped. Gn. 45, p. 240. L. B. C. 19:1806; 8:720 (as C. calycina). B.M. 1070:959 (as C. calycina).

K. C. Davis.

CLEMATIS, MOCK. *Agdestis clematidea*, which is cult. in S. Calif. and S. Fla.

CLEÒME (meaning unknown). *Capparidàceæ.* A large and mostly tropical genus of sub-shrubs or annual herbs, simple or branched, glabrous or glandular, with simple lvs. or 3–7 lfts., and white, yellow or purplish fls. borne singly or in racemes. The genus is distinguished from Gynandropsis by its short torus, which often bears an appendage, and by the 4–6, rarely 10, stamens. The garden Cleomes are chiefly interesting for their long, purple, spidery stamens and showy rose-colored petals. They succeed in sandy soils and sunny situations, and can be used like castor-oil plants to fill up large gaps in a border. *C. spinosa* is the best, and has lately been planted considerably in public parks amongst shrubbery. Prop. by seeds, which are produced freely in long, slender pods borne on long stalks. For *C. speciosa*, see *Gynandropsis.*

spinòsa, Jacq. (*C. púngens*, Willd.). Giant Spider Plant. Clammy, strong-scented, 3–4 ft. high: lfts. usually 5, sometimes 7, oblong-lanceolate, with a pair of short, stipular spines under the petioles of most of the lvs., and in the tropics some little prickles on the petioles also: fls. rose-purple, varying to white; petals 4, obovate, clawed, ½ in. long; stamens 2–3 in. long, blue or purple. N. C. to La. (nat. from Trop. Amer.) and escaped from gardens. B.M. 1640.—A tender biennial north, but annual in the tropics.

integrifòlia, Torr. & Gray. Rocky Mountain Bee-plant. Glabrous, 2–3 or even 6-ft. high: lfts. 3, lanceolate to obovate-oblong, entire, or rarely with a few minute teeth: bracts much narrower than in *C. spinosa;* petals rose, rarely white, 3-toothed: receptacle with a flat, conspicuous appendage. Along streams in saline soils of prairies.—In cult. about 20 years as a bee plant.

speciosissima, Deppe. Annual or half-shrubby, sometimes 5 ft. high: stems strongly hairy: lfts. 5–7, lanceolate, dentate, narrowed at the base, conspicuously hairy on both sides: fls. light purple or purplish rose. July to fall.—Said to be the showiest of Cleomes. Under this name a very different plant is passing, the lfts. of which have only minute hairs but rather numerous spines.

W. M.

CLERODÉNDRON (Greek, *chance* and *tree:* of no significance). Includes *Siphonantha* and *Volkameria. Verbenàceæ.* Many species in the tropics, and also in China and Jap. Some of them are greenhouse climbers; others are hardy shrubs; others are almost herbaceous.

Calyx campanulate or rarely tubular, 5-toothed or 5-lobed: corolla tube usually slender and cylindrical, the limb 5-parted and spreading: stamens 4, affixed on the corolla-tube, long-exserted and curved: style exserted, 2-cleft at the end: ovary 4-loculed: fr. a drupe enclosed in the calyx. Lvs. opposite or in 3's, usually entire, never compound.

A. *Climbing shrubs.*

Thómpsonæ, Balfour (*C. Bálfouri*, Hort.). Fig. 493. Tall, twining, glabrous evergreen: lvs. opposite, oblong-ovate and acuminate, strongly several-nerved: fls. in axillary and terminal forking panicles; calyx strongly angled, narrowed at the apex, white; corolla-limb red and spreading. W. Afr. B.M. 5313. R. H. 1867:310.—A warmhouse plant of great merit, and the most popular of the tender species. Blooms profusely on the young wood. Var. **deléctum**, Hort. (*C. deléctum* and *C. delicàtum*, Hort.). Panicles very large: calyx pure white or green-tinged: corolla large, rose magenta.

AA. *Erect shrubs or sub-shrubs.*

B. *Corolla-tube little if any longer than the large calyx: fls. white or light blush.*

fràgrans, Vent. (*C. coronària*, Hort. ?). Pubescent, half shrubby, with angled branches, 3–5 ft.: lvs. broadly ovate, with truncate or cordate base, acuminate, coarsely toothed: fls. white or blush, in terminal, compact, hydrangea-like corymbs, usually double. China, Japan. B. M. 1834.—Very desirable and fragrant plant for the coolhouse. Hardy in Fla. Lvs. ill-scented.

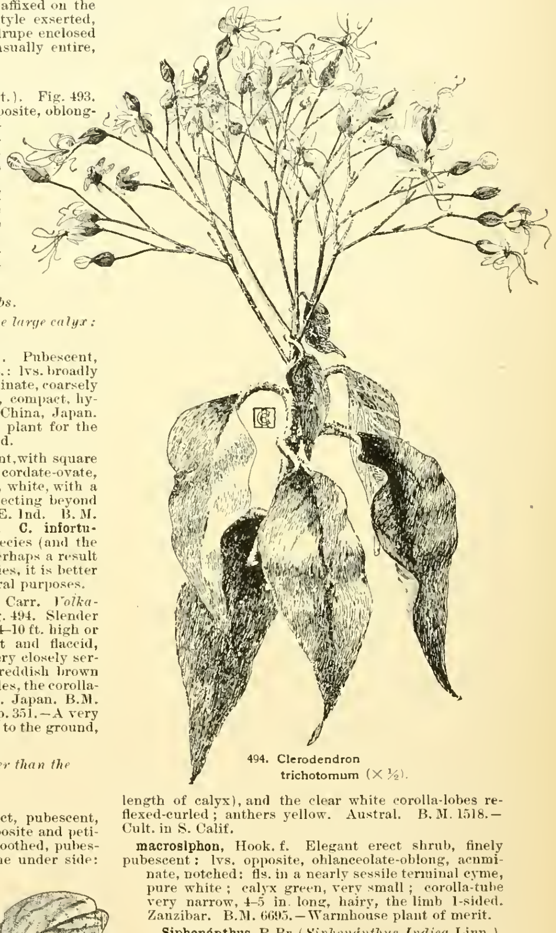
viscòsum, Vent. Height 5–7 ft., pubescent, with square branches: lvs. opposite and stalked, cordate-ovate, toothed: fls. in a loose terminal panicle, white, with a flesh-colored center, flaring, the tube projecting beyond the loose, hairy, large, 5-angled calyx. E. Ind. B. M. 1805.—Fls. sweet-scented. Greenhouse. **C. infortunàtum**, Gærtn., is said to be the same species (and the name is older), but it has scarlet fls.—perhaps a result of domestication. Even if the same species, it is better to keep the forms separate for horticultural purposes.

trichótomum, Thunb. (*C. serótinum*, Carr. *Volkamèria Japónica*, Hort., not Thunb.). Fig. 494. Slender but erect, graceful, pubescent sub-shrub, 4–10 ft. high or even higher: lvs. mostly opposite, soft and flaccid, ovate-acuminate, narrowed at the base, very closely serrate or entire, hairy: fls. white, with a reddish brown calyx, on forking, slender, reddish peduncles, the corolla-tube sometimes twice as long as the calyx. Japan. B.M. 6561. Gn. 43: 914; 51, p. 320. R. H. 1867, p. 351.—A very handsome, hardy shrub. In the N. it kills to the ground, but sprouts up if the crown is protected.

BB. *Corolla-tube thrice or more longer than the small calyx.*

C. *Fls. white.*

tomentòsum, R. Br. Shrubby and erect, pubescent, 3–5 ft. and more, often purplish: lvs. opposite and petioled, ovate-oblong, entire or sparingly toothed, pubescent on both sides, but thickly so on the under side: fls. in few-fld. opposite, forking cymes, the calyx not enlarged, the slim corolla-tube long-exserted (3–4 times length of calyx), and the clear white corolla-lobes reflexed-curled; anthers yellow. Austral. B. M. 1518.—Cult. in S. Calif.



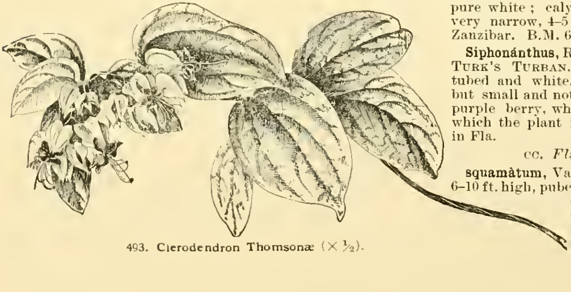
494. Clerodendron trichotomum (× ½).

macrosìphon, Hook. f. Elegant erect shrub, finely pubescent: lvs. opposite, oblanceolate-oblong, acuminate, notched: fls. in a nearly sessile terminal cyme, pure white; calyx green, very small; corolla-tube very narrow, 4–5 in. long, hairy, the limb 1-sided. Zanzibar. B.M. 6695.—Warmhouse plant of merit.

Siphonánthus, R.Br. (*Siphonánthus Indica*, Linn.). TURK'S TURBAN. Shrub, 2–6 ft. high: fls. long-tubed and white, in very large terminal racemes, but small and not showy: fr. a very showy, red and purple berry, which persists a long time, and for which the plant is chiefly grown. E. Ind.—Hardy in Fla.

CC. *Fls. red or distinctly lilac.*

squamàtum, Vahl. (*C. Kǽmpferi*, Sieb.). Grows 6–10 ft. high, pubescent: lvs. opposite, round-cordate, entire, abruptly pointed: inflorescence and fls. brilliant scarlet; fls. with small red calyx and reflexed, spreading, unequal corolla-lobes.



493. Clerodendron Thomsonæ (× ½).

China. R.B. 22:253. Gn. 42:889.—Very showy. Cult. in warm greenhouses or in the open in S. Calif. and S. Fla.

fœtidum, Bunge (*C. Búngei*, Steud.). Grows 3–6 ft., making a bush; pubescent, spiny: lvs. opposite, broad-ovate and acuminate, stalked, coarsely toothed: fls. lilac-purple, tube 3–4 times as long as calyx, in a dense capitate corymb 4–8 in. across. China. B.M. 4880. Gn. 5:25.—Cool greenhouse. Hardy in middle and southern states. Killed to the ground in the latitude of Philadelphia, but sprouts up and blooms. Blooms in August. Fls. not fœtid, but name given because of the odor of the bruised lvs. Spreads by the root.

Volkamèria odoràta, offered in the Amer. trade, is a climbing Clerodendron. *V. odorata* of the botanists is a bushy Caryopteris (C. Wallichiana). *V. odoràta* of Siebrecht & Wadley is not a vine, as described, but "a shrub, which grows from 2–4 ft. high, with soft, hairy stems, broad, oval, opposite lvs. with acute point and glaucous-hairy or almost woolly, compact clusters of white fls., shading to pink on the outside of the petals, the clusters 1½–3 in. across. Indigenous to several of the West Indian islands, particularly to Dominica, Martinique and Guadaloupe." It is not now in the American trade.

L. H. B.

CLÉTHRA (ancient Greek name of the *Alder*, transferred to this genus on account of the resemblance of the lvs.). *Ericàceæ*. White Alder. Shrub or small trees: lvs. alternate, usually serrate, deciduous or persistent: fls. white, in terminal, often panicled racemes; petals 5, erect; stamens 10; capsule splitting into 3 valves, many-seeded. About 25 species in America, E. Asia, Madeira. Only a few hardy, deciduous species are generally cultivated; valuable for their showy spikes of white, fragrant fls., appearing late in summer. They grow best in a moist, peaty or sandy soil. Prop. by seeds, sown in spring in pans in sandy and peaty soil, and by greenwood cuttings under glass, growing best if taken from forced plants in early spring and placed in slight bottom heat; also, increased by layers and by division of large plants. Handsome when forced under glass.

A. *Lvs. deciduous: stamens exserted.*

alnifòlia, Linn. Sweet Pepperbush. Shrub, 3–10 ft.: lvs. short-petioled, cuneate, obovate or oblong, sharply serrate, mostly glabrous or nearly so, 2–4 in. long: fls. fragrant, in erect, usually panicled racemes. July–Sept. Maine–Florida. M.D.G. 1895:65. J.H. III. 31:375. G.W.F.A. 22. Em. 426.—Very variable. The following forms are often described as species: Var. **paniculàta**, Arb. Kew. (*C. paniculàta*, Ait.). Lvs. cuneate-lanceolate, less toothed, green and glabrous on both sides: racemes panicled. Var. **scàbra**, Arb. Kew. (*C. scàbra*, Ait.). Lvs. scabrous above, pubescent beneath: panicles with fewer racemes. Var. **tomentòsa**, Michx. (*C. tomentòsa*, Lam.). Lvs. canescent beneath: racemes solitary or few, larger, and appearing later than the foregoing. B.M. 3743. G.F. 4:65.

acuminàta, Michx. Tall shrub or small tree, to 15 ft.: lvs. petioled, oval or oblong, acuminate, sharply serrate, almost glabrous, 3–7 in. long: racemes usually solitary, nodding. July–Sept. Alleghany Mts. Virginia to Georgia. L.B.C. 15:1427.

canéscens, Reinw. (*C. barbinérvis*, Sieb. & Zucc.). Shrub or tree, to 30 ft.: lvs. petioled, cuneate, obovate or elliptic, acuminate, sharply dentate-serrate, pubescent beneath, 3–6 in. long: racemes panicled; fls. fragrant; pedicels about as long as the fls. July–Sept. E. Asia, Philippine Isl., Java. Gt. 19:654.

AA. *Lvs. evergreen: stamens included.*

arbòrea, Ait. Shrub or small tree, to 20 ft.: lvs. cuneate, narrow-elliptic, acuminate, serrate, almost glabrous, shining above, 3–4 in. long: racemes panicled; fls. fragrant. Aug.–Oct. Madeira. B.M. 1057.—It stands only a few degrees of frost.

C. quercifòlia, Schlecht. Shrub: lvs. obovate-oblong, tomentose beneath: racemes panicled. Mexico. B.R. 28:23.—*C. tinifòlia*, Swartz. Shrub: lvs. oblong, entire, tomentose beneath: racemes panicled. Jamaica. These two only hardy in subtropical regions.

Alfred Rehder.

CLEYÈRA (after Andrew Cleyer, Dutch physician of the seventeenth century). *Ternströmiàceæ*. *C. ochnacea* is a tender shrub rarely cult. in northern greenhouses. In the south it is cult. outdoors. It has glossy foliage, numerous creamy white, fragrant fls., borne in June, and red berries, which last all winter. The genus has about nine species, and is distinguished by its petals free or scarcely coalesced, its pilose anthers, numerous ovules, and scarcely bracted flowers. Sepals 5, with 2 bractlets: petals 5: stigmas 2–3: berries 2–3-celled.

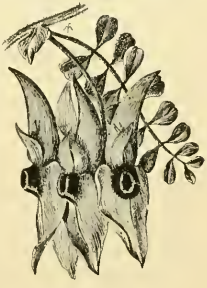
ochnàcea, DC. (*C. Japónica*, Sieb. & Zucc.). Height about 6 ft.: lvs. oval-oblong, acute at both ends, veined above, entire. Himalayas.—**C. Japònica** was distinguished by DeCandolle by its oblong-lanceolate lvs., which are veinless, and minutely serrate at the apex. Var. **tricolor**, Hort., has dark green lvs., with greyish markings, and a margin of white and rose, the variegation being more brilliant in younger lvs.

W. M.

CLIÁNTHUS (Greek, *glory-flower*). Glory Pea. Glory Vine. Parrot's Bill. *Leguminòsæ*. About five species of tender, half-trailing shrubs, with large, showy flowers of unique appearance. See Fig. 495. Swainsona is an allied genus, but its general appearance is very different. Interesting plants, with pinnate lvs. of many lfts., and fls. in racemes. Fls. scarcely papilionaceous. Pod stalked, many-seeded. Prop. by seeds and cuttings.

Clianthus Dampieri is anything but easy to grow in the latitude of Washington. Red spider is its greatest enemy, but too much moisture in the soil, followed by hot sun, proves equally fatal to it. In a sandy soil, when the seeds are sown early in spring, the plants, during ordinary summers, make a very fine display. The plants will not bear transplanting. Even when they are grown in pots, it is a risky piece of work to shift from small pots into larger ones. *C. puniceus* is an old-fashioned greenhouse plant, grown sometimes to cover rafters or trellis work, but more frequently trained around sticks placed around the edge of the pot. The flowers, not very unlike those of the common Erythrina, are freely produced in hanging clusters. Cuttings rooted in early spring may be grown into good-sized plants during the summer. Water should be given sparingly during the dull months. Pruning, repotting and tying the shoots should be done just before the growth begins. A sharp lookout should be kept for the red spider, frequent syringings being the only remedy for this pest.

Dampièri, A. Cunn. Glory Pea. Fig. 495. Height 2–4 ft.: plant glaucous and hoary, with long, whitish, silky hairs: stems slightly tinged with red: petioles longer than in *C. puniceus:* lfts. about 15, nearly opposite, sessile, usually acute: stipules larger than in *C. puniceus:* fls. 4–6 in a raceme, large, drooping, about 3 in. long, rich crimson or scarlet, with a handsome velvety, purple-black area on the raised center. Austral. B.M. 5051. R.H. 1868:230. Gt. 48, p. 272. Gn. 20:294.—Var. **Germánicus**, Hort., is also sold, and is probably var. **marginàtus**, Hort., which has one petal white, margined scarlet. See Gn. 37:746 and p. 299 for an account of grafting this species on stocks of *C. puniceus*.



495. Clianthus Dampieri. (× 2-5.)

puniceus, Banks & Soland. Parrot's Bill. Height about 3 ft.: plant glabrous: lfts. 19–21, each with a very short petiole, alternate (at least towards the end of the leaf), blunt or slightly notched: fls. 8 or more in a raceme, crimson, fading with age. New Zealand. B.M. 3584.—Cult. in eastern greenhouses, and a favorite Californian outdoor shrub. Blooms all winter in Golden Gate Park, San Francisco.

G. W. Oliver and W. M.

CLIDÈMIA (old Greek name). *Melastomàceæ*. An unimportant group in a family famous for its foliage plants. **C. vittàta**, Linden and André, once offered by

John Saul, has large, oval, pointed lvs. with 5 strong nerves, and a narrow band of white down each side of the midrib. I.H. 22:219. R.H. 1876, p. 233.

CLIFF BRAKE. See *Pellæa.*

CLIMBERS are distinguished from twiners by having some means of attachment, as tendrils or other special devices, while twiners rise by twisting their stems round their support. In a wider sense the word is often used synonymously with "vines." By "trailers," nurserymen commonly mean low-growing vines, and by "climbers," taller-growing vines. See *Vines.*

CLIMBING FERN. See *Lygodium.* **Climbing Fumitory** is *Adlumia cirrhosa.* **Climbing Hempweed,** *Mikania scandens.* **Climbing Lily,** *Gloriosa superba.*

CLINOSTÍGMA (Greek, *inclined stigma*). *Palmàceæ,* tribe *Arèceæ.* Spineless, with low or tall, prominently or obscurely ringed trunks: lvs. terminal, equally pinnatisect; segments somewhat falcate-lanceolate, broad at the base, plicate, acuminate, the apex bifid or obliquely truncate and dentate, the thick margins scarcely recurved at the base; rachis scaly, convex on the back, obtusely keeled above: spadix long: fertile branches long, thick, the floral areas distant: spathes 2–3: fr. globose or subglobose, small, red at maturity. Species 3. Australasia and Samoa.

This graceful and recent palm resembles *Howea Forsteriana* somewhat in habit of growth, but its arching lvs. spread wider, and its stems are dark purplish, and its pinnæ tough and leathery. The palm is free and clean in growth.

Mooreànum, F. Muell. (*Kéntia Mooreàna,* F. Muell.). Dwarf palm, 3–4 ft. high: lvs. 3–4 ft. long; segments about 1 ft. long, longitudinally plicate when young. New South Wales.

Jared G. Smith and H. A. Siebrecht.

CLINTÒNIA (after DeWitt Clinton, the famous Governor of New York and promoter of the Erie canal). *Liliàceæ.* A small genus of low-growing, hardy, herbaceous plants with a few, tufted, dark green, broad, shining lvs., and usually umbels of fls. They grow in cool, moist woods, and fanciers can obtain them from some dealers in native plants. It is difficult to tell the species apart by the lvs. S. Watson, in Proc. Am. Acad. 14:271 (1879). For *C. pulchella* and other species of the abandoned genus Clintonia of Douglass, see *Downingia*

A. *Scape bearing an umbel of fls.*

B. *Fls. greenish yellow.*

boreàlis, Raf. Height 1–2 ft.: fls. 3–6, nodding, green, margined yellow. Labrador to Winnipeg and south to N. C. D. 123. B.M. 1403 as *Smilacina borealis.*—This is one of the choicer plants of cool, moist woods, known to plant lovers chiefly by its handsome umbels of blue berries found in autumn, which are borne above the large, dark green, shining lvs. The commonest species.

BB. *Fls. white, with green spots.*

umbellàta, Torr. Fls. 10–20 or more, smaller than in *C. borealis,* erect or nearly so, white with a green or purplish spot at the tip of each segment. Allegheny Mts. from N. Y. to Ga. B.M. 1155.—This species has the smallest fls. of the group, and is the only one that has but a single pair of ovules in each cell of the ovary.

BBB. *Fls. deep rose.*

Andrewsiàna, Torr. Fls. 20 or more, nearly erect. California, in deep, cool woods, in clayey soil rich in mold. B.M. 7092.—The showiest of the group. Cult. by C. Purdy, Ukiah, Calif.

AA. *Scape bearing 1 white flower.*

uniflòra, Kunth. The only species in which the scape is shorter than the lvs.: fl. nearly erect. Rarely there are 2 fls. Calif. to Brit. Columb. W. M.

CLITÒRIA (derivation recondite). *Leguminòsæ.* Butterfly Pea. A wide-spread and variable genus allied to Centrosema, and characterized by the calyx tube being cylindrical and longer than the lobes; standard narrowed at the base, not appendaged on the back: style often bearded. The most important garden plant is *C. Ternatea,* a warmhouse annual twiner, reaching 15 ft., and requiring no special culture. It has very showy blue fls., and lately interest in it has revived.

A. *Leaflets 5.*

Ternatèa, Linn. (*C. cærùlea,* Hort.). Annual warmhouse climber: lfts. 5, oblong, obtuse, short-petioled: fls. 1 in. or more long, rich blue, with beautiful and variable markings, especially on the standard. B.M. 1542. Gn. 38:765. P.M. 7:147 and 13:79.—Name from Ternate, one of the Molucca Islands, and not from ternate, meaning 3-leafleted. Prop. by seeds. *C. alba,* Hort., is a white form. More or less double forms have been known for over a century.

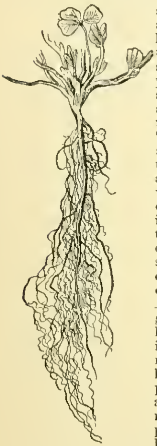
AA. *Leaflets 3.*

Mariàna, Linn. Hardy, perennial, smooth, erect, or slightly twining, 1–3 ft. high: lfts. 3, obovate or ovate-lanceolate: fls. light blue, 2 in. long, on short peduncles: pod straight, few-seeded. Summer. Dry banks, N. Y. to Fla. and west to Mo. Also India and Burma.—Rarely sold by dealers in native plants. W. M.

CLÌVIA (after a Duchess of Northumberland and member of the Clive family). Syn., *Imantophyllum. Amaryllidàceæ.* A genus of 3 species of tender, bulbous plants from South Africa, with handsome evergreen foliage and showy, bright red fls. in large umbels. *C. miniata* is the best species, and perhaps a dozen varieties and hybrids of it have been offered at various times. The genus is distinguished by its fruit being a berry, its several ovules, and imperfect bulb. J. G. Baker, Amaryllideæ, p. 61. Clivias make excellent house plants, but, like Amaryllis, they are too costly to be very popular. They have the advantage over Amaryllis of having attractive foliage all the year round, and are more certain to bloom well. They have thick, fleshy roots, like an Agapanthus.

496. Clivia miniata.

All of the species are well worth growing, because of their handsome umbels of flowers, produced during the spring and early summer months. They are evergreen plants of the Amaryllis family, with thick, leathery, strap-shaped leaves. *Clivia miniata* is the species most commonly grown. There are several distinct forms of this, with larger and deeper colored flowers. Established plants may be grown in the same pots for several years, if the plants are fed during the growing period with weak liquid manure. In potting, the soil given should be of a lasting nature, not easily soured, nor apt to become sodden. In arranging the drainage, place one large piece, concave side down, over the hole, and around this arrange several smaller pieces. Over these place one or two handfuls of pieces small enough to go through a No. 2 sieve. The best time to pot is after the flowers have been produced. The plants should then be kept for some time in a humid atmosphere to encourage growth, receiving an abundance of water after they are well started. After growth has been completed, they will winter safely in an ordinary greenhouse temperature (not under 40°), if kept rather dry at the root. For propagation, select old plants which have become crowded in their pots, so that the entire plant can be pulled to pieces. After trimming the roots, put the growths in small pots and keep in heat, to encourage root action. Clivias are well suited for planting permanently in the front part of greenhouse borders. The soil for this purpose should be rich and well firmed about the roots. Withhold water as much as possible during the resting period, or the plants will produce leaves at the expense of the flowers.



497.
Trifolium pratense.
Root-system.

A. *Fls. erect; perianth broadly funnel-shaped.*

miniàta, Regel (*Imantophýllum miniàtum*, Hook.). Fig. 496. Lvs. 16–20, in a tuft, sword-shaped, tapering to a point, 1½ft. long, 1½–2 in. broad: fls. 12–20, in an umbel; perianth erect, bright scarlet, with a yellow throat; tube broadly funnel-shaped, longer than *C. nobilis;* segments about 2 in. long, the inner ones broader than the outer; stamens shorter than the segments; style not exserted: berries ovoid, bright red, 1 in. long. Natal. B.M. 4783. R.H. 1859, pp. 126, 127. F.S. 9:949; 23:2373. I. H. 26:343; 36:80; 37:102; 40:177. R.H. 1869:250, and 1894, p. 572.—*I. cyrtanthiflòrum*, Van Houtte (F.S. 18:1877), is a hybrid between this species and the next.

AA. *Fls. pendulous; perianth narrowly funnel-shaped.*

nóbilis, Lindl. (*Imantophýllum Àitoni*, Hook.). Lvs. about 12, strap-shaped, very obtuse, with a roughish edge: fls. 40–60, in an umbel; perianth curved and drooping; tube narrowly funnel-shaped, shorter than in *C. miniata;* segments tipped with green, about 1 in. long; stamens as long as the segments; style exserted. Cape Colony. B.M. 2856. L.B.C. 20:1906. Int. to cult. 1828. *I. cyrtanthiflòrum*, Van Houtte (F.S. 18:1877), said to be a hybrid between this and the above, shows little if any influence of *C. miniata*. It has the narrow-tubed, pendulous fls. and the greenish tinge of *C. nobilis*. R.H. 1894, p. 573.

G. W. OLIVER and W. M.

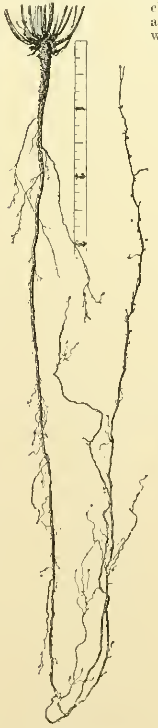
CLOUDBERRY. See *Rubus*.

CLOVE PINK. The Carnation, *Dianthus Caryophyllus*.

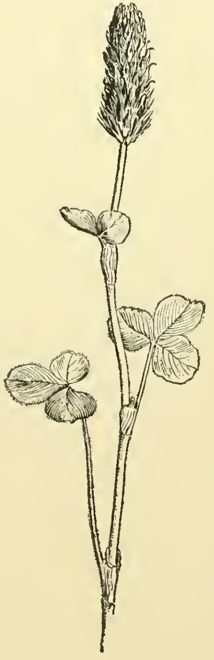
CLOVER. Species of *Trifòlium* (Leguminosæ), particularly those which are useful in agriculture. The word is also applied to species of related genera, as Medicago. The Sweet Clover is Melilotus. Bush and Japan Clover are Lespedezas. Prairie Clover is a Petalostemon.

Of Trifolium there have been described about 300 species. These are widely dispersed in temperate climates. The fls. are papilionaceous but small, and are disposed in dense heads or spikes. Lvs. are digitately or palmately 3-foliolate. The common Red Clover is *T. praténse*, Linn., now thoroughly naturalized in N. America, but supposed not to be native here. It is European. It is valuable both for stock feed (as pasturage and hay), and also as a green manure. As a manure crop, it is particularly valuable because of its deep root-system and its power (in common with other leguminous plants) of fixing the nitrogen of the air by means of its subterranean parts. Fig. 497 illustrates the root-system. Fig. 498 shows the root of a 15-months' old plant which grew in hard clay soil. It is 22 inches long, and some of the root was left in the ground. The Mammoth Red Clover (*T. mèdium*, Linn.), is probably an offshoot of *T. pratense*. It is usually a larger plant, with zigzag stem, entire and spotted lfts. and longer-stalked head. White Clover, or Shamrock, is *T. rèpens*, Linn., intr. from Europe, and supposed to be native to N. America as well. Alsike Clover, *T. hýbridum*, Linn., is of European nativity. The Crimson or Scarlet Clover (Fig. 499), an annual from S. Eu., is now much grown as a catch- or cover-crop in orchards. See *Cover-crops*. It is also highly ornamental, and is worthy the attention of the florist.

L. H. B.

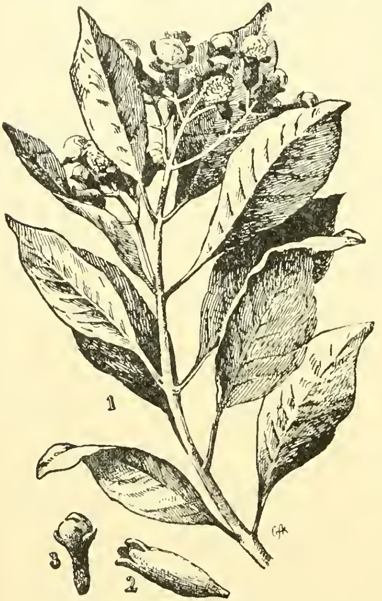


498. The penetrating root of the Red Clover.



499. Crimson Clover — Trifolium incarnatum (× ⅓).

CLOVES are the dried flower-buds (Fig. 500) of a handsome tree of the myrtle family, *Eugenia caryophyllata*, better known as *Caryophyllus aromaticus*, a native of the Spice Islands, but now cultivated in the West Indies and elsewhere. Caryophyllus, the ancient name of the Clove, means nut-leaf. The carnation, or "clove pink," was named *Dianthus Caryophyllus* because of its clove-like odor, and it has become the type of the great order Caryophyllaceæ, which, however, is far removed botanically from the Myrtaceæ. The word "gilliflower" is a corruption of caryophyllus, and, until Shakespeare's time and after, was applied to the carnation, but now-a-days it usually refers to several cruciferous plants of the genus Cheiranthus and Matthiola.



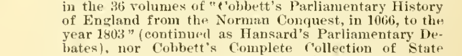
500. Clove.
Spray of leaves and flowers (1); an unopened bud or clove (3); the expanded flower (2).

CLUB MOSS. See *Lycopodium.*

CNÌCUS (Greek, *knizein*, to injure). *Compósitæ.* THISTLE. A genus of perhaps 200 species, containing many much-hated weeds, especially the common Thistle, *C. lanceolatus*, and the Canada Thistle, *C. arvensis*, Fig. 501. About a dozen species have been slightly cultivated in rockeries and wild gardens. The genus Chamæpeuce, now referred to Cnicus, contains 3 plants slightly used abroad in subtropical and carpet bedding: *C. Afer*, *C. Casabonæ*, and *C. Diacantha*, which are cult. for their rosettes of prickly lvs. The fls. appear the second year. *C. benedictus* is an old name of the Blessed Thistle, for which see *Carbenia*.

COBBETT, WILLIAM (1762–1835). The once famous English author had two periods of enforced residence in America, and wrote "The American Gardener," which is one of the spiciest books in the whole history of American horticulture. Plate II. He was of thorough Saxon ancestry, and while a gardener's lad and during eight years of military service, made strenuous efforts at self-education. In 1792 his personal liberty was endangered by the publication of "The Soldier's Friend" (an appeal for an increase of pay), and he came to Philadelphia in the autumn of that year. His first success was a pamphlet entitled, "Observations on Dr. Priestly's Emigration," a bitter attack on the French Revolution. He took the loyalist side in American politics, and is regarded as the founder of the American party press. His attack on Benjamin Rush, the leading physician of Philadelphia, for his advocacy of unlimited bleeding for yellow-fever, resulted in a libel suit, and damages of $5,000, which nearly ruined Cobbett, and sent him to England in June, 1800. In 1802 he began "Cobbett's Weekly Political Register," which he edited for 33 years, and until his death, except during an interval of imprisonment and a second withdrawal to America. His real work was domestic reform, and the circulation and influence of his journal were immense. In 1801–2 he reprinted his American writings in 12 volumes, entitled, "Porcupine's Works." After 1804 he usually lived on his farm at Botley, in Hampshire, where he conducted many experiments. In 1817 he was again compelled to leave England, and for the next two years he lived in America. His life was one incessant conflict. He lived to see the reform of 1832, and his work was fittingly rewarded by a place in Parliament, but he was then too old to do much damage, and he died within three years thereafter. Cobbett's faults are all obvious, his egotism towering above the rest, and barely falling short of sublimity. He was not a genius, but his talents were extraordinary, and his versatility amazing. His "English Grammar" (London, 1818), written from Long Island in the form of letters to his 15-year-old son, was said by Bulwer Lytton to be the only amusing grammar in the world. Hazlitt declared that it is as interesting as a story-book, and Alfred Ayers, in his admirable edition (New York, 1883), declares that it is probably the most readable grammar ever written, and that for purposes of self-education it is unrivalled. (For a list of Cobbett's writings, see Edward Smith's excellent sketch in the Dictionary of National Biography.) After Cobbett's death, his sons published in 6 volumes (beginning 1857) "Selections from Cobbett's Political Works; being a complete abridgment of the 100 volumes which comprise the writings of 'Porcupine,' and 'The Weekly Political Register.'" These 100 volumes, of course, do not take into account his non-political writings, nor his editorial work in the 36 volumes of "Cobbett's Parliamentary History of England from the Norman Conquest, in 1066, to the year 1803" (continued as Hansard's Parliamentary Debates), nor Cobbett's Complete Collection of State Trials (afterwards known as Howell's), nor many other works which he either edited, translated, or published. The anti-Cobbett literature is exceedingly voluminous, and almost every charge has been made against the man, except that of being uninteresting. According to Henry Cabot Lodge (whose masterly appreciation in "Studies in History" [Boston, 1885], should be consulted by the student immediately after direct contact with Cobbett's writings), Cobbett's true value is understood by his thoroughly representative character as a type of his time and people. As historical documents, his works are indispensable.

Cobbett's horticultural writings of chief interest to us are "Cottage Economy," "A Year's Residence in the United States of America, and, most of all "The American Gardener" (1821), which was reproduced with considerable modifications as "The English Gardener," in London, 1827. The American edition of Wm. Forsyth's excellent "Treatise on the Culture and Management of Fruit Trees," was published at New York and Philadelphia in 1802, and in Albany in 1803, and was one of the most influential books on fruit growing in the



501. Leaf of Canada Thistle (× ⅓).

period before orcharding over large areas gave rise to essentially American horticultural writings. Unfortunately for horticulturists of the present day, Cobbett's thunder seems forever silenced. He has the fatal faults of being old and amusing. Yet, to the discriminating mind, Cobbett's horticultural writings, especially "The American Gardener" (which is still not uncommon in second-hand book stores), are full of suggestiveness and refreshment. W. M.

COBŒ̀A (after Father Cobo, Spanish Jesuit of the seventeenth century, naturalist, and resident of America for many years). *Polemoniàceæ.* A genus of 6 tropical American climbers, of which *C. scándens*, a tender perennial plant, is amongst the dozen most popular vines commonly treated as annuals. This is the only genus of climbers in the order. Prop. by seeds, which should be placed in moist earth, edge down. It is a rapid grower.

502. Cobœa scandens (× ⅓).

scándens, Cav. Figs. 502, 503, 504. Height 10–20 ft.: lfts. in 2 or 3 pairs, the lowest close to the stem, and more or less eared: fls. bell-shaped, 1–1½ in. across, light violet or greenish purple, with protruding style and stamens: tendrils branched. Mex. B.M. 851. There is a white-fld. form (*C. álba*, Hort.), and one with variegated lvs., var. **variegàta,** Hort.—The terminal lft. is represented by a tendril (Fig. 502). Sometimes there are indications of tendrils on other lfts. (Fig. 504), making the plant an interesting one for students of morphology.

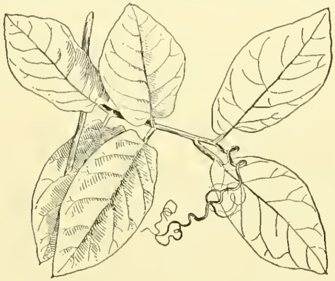
macrostémma, Pav. Taller, later-flowering, the stems and foliage not purple-tinged: fls. yellow-green, with exserted stamens. Guatemala. W. M.

COBNUT. Consult *Corylus.*

COBÚRGIA. See *Stenomesson.*

COCA. The lvs. of *Erythroxylon Coca*, used in medicine. Sold chiefly as a fluid extract. Cocaine is the famous local anæsthetic.

COCCÍNEA (Latin, *scarlet;* referring to the ornamental gourds). *Cucurbitàceæ.* Thirteen species of tender perennial vines, from the tropics of Asia and Africa, usually with tuberous roots. Lvs. angled or lobed, sometimes glandular: fls. white or yellowish, large: fr. a small, scarlet gourd, sometimes marbled, with an insipid pulp. A. Coigneaux in DC., Mon. Phan. 3: 528. *C. cordifolia* is treated as a tender annual, requiring an early start and no special culture.



503. Normal leaf of Cobœa scandens.

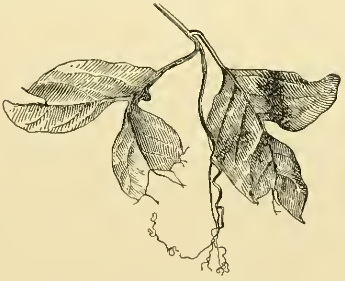
A. *Tendrils simple: male fls. solitary: lvs. small.*

cordifòlia, Cogn. (*C. Índica*, Wight & Arn.). Height about 10 ft.: lvs. small, 1–2 in. long, glossy, ivy-like, short-petioled, obtusely 5-angled: fls. white, bell-shaped: fr. roundish at both ends, about 2 in. long, 1 in. thick. India.

AA. *Tendrils bifid: male fls. in racemes: lvs. large.*

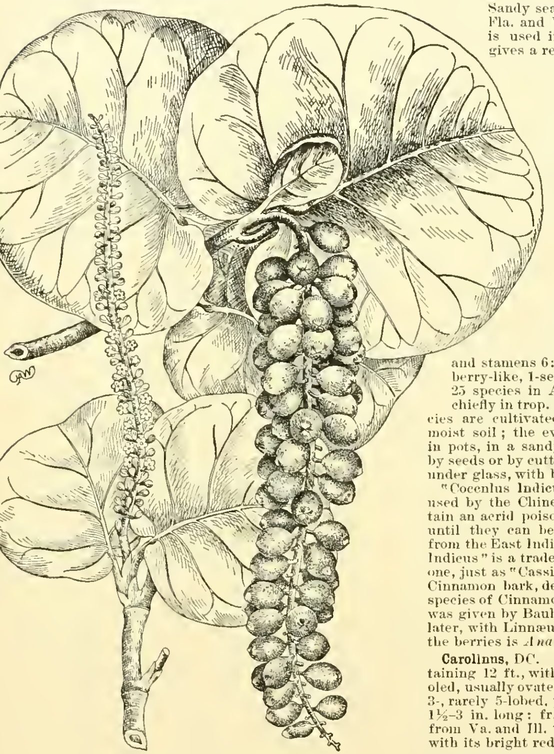
palmàta, Cogn. (*Cephalándra palmàta*, Lond.). Attaining 30 ft.: lvs. large, 3–4 in. long and wide, long-petioled, palmately 5-lobed: fls. yellowish: fr. ovate, acute. Natal. Int. by P. Henderson & Co., 1890.—A rare greenhouse plant. W. M.

COCCÓLOBA (Greek, *lobed berry;* referring to the ends of the pear-shaped fr.). *Polygonàceæ.* This genus, which contains the 2 interesting fruits described below, consists of about 80 tropical trees and shrubs, sometimes tall climbers, with alternate, usually leathery, entire lvs., which are sometimes very large, sometimes very small: sheath or ocrea various: fls. in racemes, on short pedicels between small, ocrea-like bracts. For *C. platyclada*, see *Muehlenbeckia.*



504. Monstrous or abnormal leaf of Cobœa.

Coccoloba is a genus of tropical evergreen shrubs and trees, mostly of an ornamental character. *C. uvifera*, the Sea-grape or Shore-grape of the West Indies, bears an edible fruit, and has particulary beautiful foliage. This species is the most important of the genus, and is worthy of a place among ornamental plants under glass. As it will withstand but slight frost, its cultivation outdoors in the United States is limited to warmer parts of Florida and California, but it may be bedded outdoors during the summer, in temperate latitudes forming a fine addition to the list of plants more commonly employed. All species are easily propagated by seeds, which germinate freely when not too old. Some species may be quickly increased by cuttings of ripe wood, which root readily in sand under usual conditions, in a frame or propagating house. Layering may also be employed to increase a stock. The various species grow naturally in both clayey and sandy soils, revelling in moist, rich earth and a high temperature. *C. uvifera* frequents the seashore, and is found growing in sand and broken shells, apparently lacking altogether in plant-food. Rich, sandy soil of a light character seems to be the best for all species so far known. Plants are readily transplanted from open ground, but pot-grown plants are to be preferred. Cult. by E. N. Reasoner.



505. Coccoloba uvifera (× ⅓)

uvífera, Linn. Sea-grape. Shore-grape. Fig. 505. Tree, reaching 20 ft. or more, with many flexuous branches: lvs. large, often 5 in. long by 7 in. wide, broadly heart-shaped, wavy margined, glossy, leathery, midrib red at the base; petioles short, with sheathing stipules at the base: racemes 6 in. long, erect, in fl. nodding in fr.: fls. 1½ in. across, white, fragrant; petals 5; stamens 8; styles 3: berries 9 or more in a raceme, small, about ½in. long, pear-shaped, reddish purple, dotted green, sweetish acid: nut roundish, with a short, sharp point on top, and vertical wrinkles. Sandy seashores of Trop. Amer., especially S. Fla. and West Indies. B.M. 3130.—The wood is used in cabinet work, and, when boiled, gives a red color..

Floridàna, Meissn. Pigeon Plum. Tree, 25–30 ft.: lvs. 1½–3 in. long, 1–2 in. wide, ovate or elliptical, narrowed at both ends, obtuse, margin slightly recurved: berries small, ⅓in. long, pear-shaped, edible, but not marketable. S. Fla.—This has lately been considered a synonym of *C. laurifolia*, but the two species are well distinguished in DC. Prod. 14:165.
W. M.

CÓCCULUS (diminutive of *kokkos*, berry; the fr. being berry-like). (*Cebatha.*) *Menispermàceæ.* Twining or erect shrubs: lvs. alternate, petioled, entire or lobed, with entire margin, deciduous or persistent, palminerved: fls. inconspicuous, diœcious, in axillary panicles or racemes, sometimes terminal; sepals, petals and stamens 6: carpels 3–6, distinct, developing into berry-like, 1-seeded drupes; seed reniform. About 25 species in America, Asia, Africa and Australia, chiefly in trop. and subtrop. regions. Only a few species are cultivated, thriving in almost any somewhat moist soil; the evergreen kinds are sometimes grown in pots, in a sandy compost of peat and loam. Prop. by seeds or by cuttings of half-ripened wood in summer, under glass, with bottom heat.

"Cocculus Indicus" is the trade name of the berries used by the Chinese in catching fish. The berries contain an acrid poison, which intoxicates or stuns the fish until they can be caught. The berries are imported from the East Indies to adulterate porter, and "Cocculus Indicus" is a trade name with druggists, not a botanical one, just as "Cassia lignea" is a trade name of a kind of Cinnamon bark, derived, not from a Cassia, but from a species of Cinnamomum. The name "Cocculus Indicus" was given by Bauhin, but binomial nomenclature began later, with Linnæus, in 1753. The plant which produces the berries is *Anamirta Cocculus.*

Carolìnus, DC. A rapid-growing, twining shrub, attaining 12 ft., with pubescent branches: lvs. long-petioled, usually ovate, sometimes cordate, obtuse, entire or 3-, rarely 5-lobed, pubescent, glabrous above at length, 1½–3 in. long: fr. red, ¼in. in diam. Along streams, from Va. and Ill. to Fla. and Tex.—Decorative in fall, with its bright red fr. Not hardy N. of New York.

C. Japónicus, DC.=Stephania hernandifolia.—*C. laurifòlius*, DC. Erect shrub, to 15 ft., glabrous: lvs. evergreen, oblong, acute at both ends. Himal. Decorative, with its bright green, shining foliage. Only hardy in subtropical regions.—*C. Thùnbergi*, DC. Similar to C. Carolinus, but fr. bluish black. Hardier. Japan.
Alfred Rehder.

COCHLEÀRIA (Latin, *cochlear*, a spoon; referring to the lvs.). *Cruciferæ.* This genus, which includes the Horse Radish and Scurvy Grass, is composed of glabrous herbs, mostly perennial, of various habit, with lvs. alternate or in rosettes: fls. mostly white, racemose, bractless: pods various, but never winged. The word cochlear is a technical term used in describing æstivation, and refers to one piece which is larger than the others, hollow like a bowl or helmet, and including the rest, as in Aconitum.

Armoràcia, Linn. (*Nastúrtium Armoràcia*, Fries). Horse Radish. Hardy perennial, 2 ft. high: roots large and fleshy, furnishing the familiar condiment: root-lvs. very large, more or less cordate or oblong; stem-lvs. lanceolate, uppermost linear, entire: fls. white. May. Naturalized from Eu. and escaped.—It flowers frequently, and very rarely perfects any seeds. For culture, see *Horse Radish.*

officinàlis, Linn. SCURVY GRASS. Hardy biennial, 2–12 in. high, but cult. as an annual: root-lvs. petioled, cordate; stem-lvs. sessile, oblong, more or less toothed: fls. early spring; calyx lobes erect. Arctic regions. Vilmorin, Veg. Gard. 515.— Prop. by seed, which is small, oval, slightly angular, rough-skinned, reddish brown. The germinating power lasts 4 years. The green parts of the plant are strongly acrid, and have a tarry flavor. The seed is sown in a cool, shady position, where the plants are to stand. The lvs. are rarely eaten as salad, but the plant is mostly grown for its anti-scorbutic properties. W. M.

COCHLIÒDA (Greek for *spiral*, in reference to the structure of the lip). *Orchidàceæ*, tribe *Vándeæ*. A small genus of orchids found at high elevations in South America. Pseudobulbous. Flowers bright rose-color or scarlet. Some of the species are retained by various authors in Odontoglossum and Mesopinidium. Culture of Odontoglossums.

Noetzliàna, Rolfe. Pseudobulbs ovate-oblong, compressed, about 2 in. long, monodiphyllous: lvs. linear, peduncles arcuate: fls. numerous, in graceful racemes, orange-scarlet, about 1 in. across; sepals oblong; petals rather ovate; labellum 3-lobed, disk yellow, otherwise similar in color to the petals. Andes. B.M. 7474. Gt. 43:1403. G.C. III. 16:71.

ròsea, Hort. Plants similar to *C. Noetzliana*: fls. rose color. Peru. B.M. 6084. I.H. 18:66.

vulcánica, Benth. & Hook. Peduncles more or less erect: fls. larger than in the preceding, bright rose-color; labellum 3-lobed, provided with 4 ridges. Peru. B.M. 6001.

OAKES AMES.

COCHLIOSTÈMA (Greek, *spiral stamens*). *Commelinàceæ*. A genus of 2 species, which are among the most curious and gorgeous plants cultivated under glass. They are epiphytes, with the habit of Billbergia and great axillary panicles of large flowers of peculiar structure and beauty. They are stemless herbs from Equador, with large, oblong-lanceolate lvs., sheathing at the base, and fls. which individually last only a short time, although a succession is kept up for several weeks; sepals 3, oblong, obtuse, concave; petals 3, nearly equal, wider than the sepals, margined with long hairs; staminodes 3, villous, 2 erect, linear, the third short, plumose; staminal column hooded, with incurved margins, enclosing 3 spirally twisted anthers; style slender, curved. For an interesting theory of the peculiar staminodes, see G.C. 1868: 323, 264.

Cochliostemas are handsome stove-flowering perennial plants, closely related to the Commelinas, and are of comparatively easy culture, thriving well in ordinary stove temperature in a mixture of 2 parts loam and 1 part fibrous peat, with a little well-decayed cow- or sheep-manure added when potting mature plants. They like a copious supply of water at the roots during the summer months, and at no season must they be allowed to become dry. Propagation is effected by division of the plants in early spring, or by seeds, to obtain which the flowers must be artificially fertilized. The seeds should be sown as soon as ripe in shallow pans of light, peaty soil, and placed in a warm, close atmosphere until germinated. As soon as the seedlings are large enough, they should be potted singly into thumb-pots, and shifted on as often as they require it, when they will flower in about 12 months. The chief reason why Cochliostemas are grown in America so little is, probably, that we have to keep a much more humid atmosphere in stove-houses here than in England, and that is very much against all stove-flowering plants, causing the season of blossoming to be very short.

A. *Lvs. red beneath: panicle hairy: fls. very fragrant.*

odoratissimum, Lemaire. Lvs. lighter green above than in *C. Jacobianum*, and deep purplish red beneath, narrower, and with a similar margin: fls. very numerous; sepals more leaf-like, hairy, green, with a reddish tip. I.H. 6:217. R.H. 1869, p. 170.—Not advertised at present, but fully as interesting as the next.

AA. *Lvs. green beneath: panicle not hairy: fls. less fragrant.*

Jacobiànum, C. Koch and Linden. Height 1–3 ft.: lvs. in a rosette, spreading or recurved, dilated and sheathing at the base, margined brown or purplish, 3–4 ft. long, 6 in. broad at the base, 4 in. broad at the middle: peduncles stout, white, tinged purple, 1 ft. long: bracts large, opposite and whorled, 3–4 in. long, acuminate, concave: panicle branches 4–6 in. long: fls. 2–2½ in. across; sepals purplish; petals violet-blue. Autumn. B.M. 5705. R.H. 1868:71.

EDWARD J. CANNING and W. M.

Cochliostema odoratissimum is much like *C. Jacobianum*. Is a very interesting plant of rapid growth and easy culture. It is raised from seed. It seeds freely when fertilized at the proper time. Only a few of the stronger or larger flowers should be allowed to bear seed. Sometimes a simple shaking of the flower stalk will accomplish the necessary work of fertilizing, but it is safer to employ the regular method to insure thorough impregnation. The seeds ripen within 6 weeks' time, and they can be sown soon thereafter. In 5 or 6 months from seed the plants will bloom. The flowers, while not very showy, are fragrant and interesting. The plant itself is ornamental by reason of its curiously marked, striped and veined leaves. The plant thrives best in rich, light, loamy soil. First sow in boxes or seed pans in light, sandy soil; then transplant into small pots; keep the young plants in a warm, moist place and repot before the pot is filled with roots, never allowing the plant to get "hard," as it is called, but keep it growing continuously, and when in 6- or 7-inch pots, allow the plant to get somewhat pot-bound and give more air, and it will soon set flower buds. Then place a mulch of old cow- or sheep-manure on the top of the pot, or use liquid manure once or twice a week, keeping the plant in a cool position. The above treatment will secure numerous flowers over a long period. Fall and winter. H. A. SIEBRECHT.

COCKSCOMB. See *Celosia*.

COCKSFOOT GRASS. Same as Barnyard Grass, *Panicum Crus-Galli*.

COCOA. Seeds of *Theobroma Cacao*.

COCOA PLUM. *Chrysobalanus Icaco*.

CÒCOS (Portuguese, *monkey*, from the nut, which suggests a monkey's face). *Palmàceæ*, tribe *Cocoìneæ*. This genus includes the Cocoanut tree, *C. nucifera*, and a few palms that are cultivated for ornament in the north under glass, and in S. Fla. and S. Calif. as avenue and ornamental trees. Of the species cult. for ornament, *C. Weddelliana* is by far the most important. It is sold in great quantities from 3- and 4-inch pots when the plants are 12–15 in. high. They are favorite house-plants, as their culture is easy, and they grow slowly and retain their beauty a long while. They are much used in fern dishes. As a house-plant, *C. Weddelliana* is probably the most popular species of all the smaller palms. It is especially suitable for table decoration. The genus is allied to Maximiliana and Attalea, and distinguished by its male fls. having lanceolate petals, 6 included stamens, and a 1-seeded fruit.

Low or tall spineless palms, with slender or robust ringed trunks, often clothed with the bases of the lvs. Lvs. terminal, pinnatisect; segments ensiform or lanceolate, equidistant or in groups, 1- to many-nerved, entire at the apex, or with 1 lateral tooth, or more or less deeply lobed,—the margins smooth, recurved at the base: rachis 3-sided, acute above, convex on the back: petiole concave above, smooth or spiny on the margins: sheath short, open, fibrous; spadices erect, at length drooping, the branches erect or drooping; spathes 2, the lower one the shorter, split at the apex, the upper one fusiform or clavate, woody, furrowed on the back; bracts variable; fls. white or yellow: fr. large or medium, ovoid or ellipsoidal, terete or obtusely 3-angled. Species about 30. Tropical and sub-tropical S. Amer., 1 in the tropics around the world.

J. G. SMITH and W. M.

The Cocoanut Palm naturally grows on the seashore, or in its immediate vicinity, and does not bear well when at a great distance from salt water, although its growth may be strong. In cultivation, this fact is kept in mind and plantations are laid out on sandy or shelly tracts of land bordering the sea, where it is almost impossible to raise anything else of value. This soil consists of coarse sand, broken shells and litter of the sea, and is apparently very poor in quality, yet the Cocoanut thrives on it and bears abundantly. Propagation is by seeds only. These are selected from the most desired strains, as the nuts vary greatly in size, shape, and quantity and quality of the meat. They must be perfectly ripe before planting, which is usually done without removing the outer husk. A shallow trench is scooped out of the sand, the nuts are laid in thickly on their sides and then the sand is thrown back over them to a depth of from 4–10 in., according to the moisture of the soil. After some months, when they have germinated and the seed leaf is well developed, they are usually dug and planted out permanently about 20 ft. apart. The young palms are kept free from weeds and encroaching beach creepers for 3 or 4 years, until they reach a considerable size, after which they seldom get any cultivation. A mulching of seaweed and other vegetable matter proves of much benefit, but as the profit is so small in Cocoanut culture, thorough manuring is not attempted. Cocoanut Palms are of tropical growth, yet may be grown outside the tropics to a slight extent, as in southern Florida, where occasional light frosts occur.

E. N. Reasoner.

As a decorative subject under glass, *Cocos nucifera* is but little grown, owing to its large size, but when given an abundance of water, a rich, loamy soil, and a night temperature of 70°, it is not especially difficult to manage, and while the young plants do not give a proper idea of the mature Cocoanut Palm, their development is interesting to watch.

The most valuable Cocos to the florist is the Dwarf Cocoanut, *C. Weddelliana*, the seeds of which are sent from Brazil to the large American and European palm growers by the million each season. These seeds are about half an inch thick. They usually arrive in the spring, and should be sown at once in a warm greenhouse and kept continually moist, and if they are in good condition and kept at a temperature of about 75°, they frequently begin to germinate in 6 to 8 weeks.

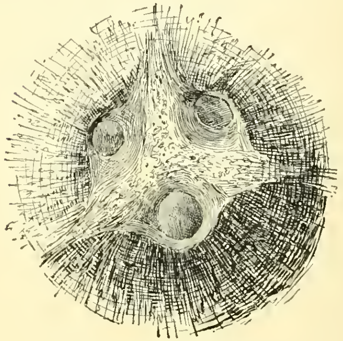
A light and rather open soil is preferable for Cocos seeds, some growers using pure peat for this purpose with good results. When the seedlings are making their second leaf they may be potted off, and this is one of the critical periods in the culture of *C. Weddelliana*, the young roots being so stiff and brittle that much care is needed to get them into a 2- or 2½-inch pot, and if the main root is broken the seedling seldom recovers.

Deep pots are, therefore, best for this purpose. The seedlings should be kept rather close during the day for the first few weeks after potting, and then may be aired quite liberally, and also syringed freely. A night temperature of 65–70° will answer very well for the young plants, and they should never be allowed to become very dry, or a yellow and unhealthy condition is liable to follow. Through the summer the plants may be repotted as they may need it, but it is not wise to disturb the roots after the middle of October, the root action of these plants being rather sluggish during the winter months.

Soil should be well-drained, rather sandy in texture, and may be enriched with some dry cow-dung, or a moderate quantity of bone dust.

Cult. by W. H. Taplin.

The Cocoanut is the example most commonly cited of dispersal of seeds by water. Its buoyant, impervious husk is said to enable it to cross an ocean without losing its germinating power. Its structure is interesting and at first puzzling. Although it is a dry, indehiscent, 1-seeded fruit, it seems very unlike an akene, as for instance, in the Compositæ. Structurally, it is more like a drupe, for the fibrous husk is formed from the outer part of the pericarp, and the hard shell enclosing the meat from the inner. In other words the husk is exocarp and the shell endocarp. The milk of the Cocoanut is unsolidified endosperm. In the cereal grains it is the endosperm which affords most of the material used for human food. Only a part of the liquid matter of the Cocoanut solidifies, and the milk is left in the center. The eyes of the Cocoanut (Fig. 506) mark the positions of the micropyles, and germination takes place only through the larger one. Palm pistils are 3-carpelled and each carpel in Cocos has 1 ovule. The marks of the 3 carpels are seen in Fig. 506, but only 1 ovule develops into a seed. Fig. 507 tells the story of the growth of a Cocoanut. In *a*, the young nut is enveloped by 3 petals and 3 sepals. At *b*, the pericarp has far outgrown the sepals and petals. The floral envelopes remain upon the tree when the nut is picked. Cocoanuts, like many other fruits, often grow to a considerable size without pollination, and then perish.



506. End of a mature cocoanut.
The nut sprouts usually from the largest eye.

In distinguishing tropical from subtropical regions, the Cocoanut is an excellent guide. It flourishes best where frost is never known. The oil extracted from the nuts is an important article of commerce. The fiber refuse is much used by florists and gardeners. Being open, spongy, very retentive of moisture, clean and easily handled, it is a favorite material in which to root bedding plants and to start very small seeds; but it is not used for permanent potting.

L. H. B.

A. *Filaments present on the rachis.*

eriospàtha, Mart. Stem 9–15 ft. high, 10–14 in. thick, capitately thickened with the persistent bases of the petioles; lvs. ample, glaucous, finely pectinate: margins of the rachis with excurrent filaments; segments about 1 in. apart, the lower elongated, linear, 20–24 in. long, very long-acuminate, the upper narrowly linear, short, attenuate, 1 ft. long, 2 lines wide, all rigid, faintly nervose-striate. S. Braz.—"The hardiest of the genus and one of the hardiest palms in southern Calif. Fronds bluish: fr. pulp tastes like apricots."—*F. Franceschi, Santa Barbara.* Rather coarse for cultivation under glass.

AA. *Filaments absent.*

B. *Rachis abruptly contracted above the insertion of the lowest lfts.*

flexuòsa, Mart. Stem 9–12 ft. high, 2–3½ in. in diam., arcuate-ascending, naked just above the base, thence densely clothed with dead petiole bases; lvs. lax, 3–6 ft. long: petiole flat above, arcuate, at first tomentose, later smooth: rachis abruptly narrowed above the insertion of the lowest leaf-segment, thence linear-filiform at the apex, excurrent; segments 70–90 on each side, rigid in opposite groups, the middle 10–14 in. long, ⅓ in. wide, the upper 4 in. long, 1-12in. wide. Braz.—Cult. in northern greenhouses. An avenue tree in S. Fla. and S. Calif. "Similar in habit to *S. plumosa*, but with more finely cut lvs., and in S. Eu. considered to stand more frost."—*Franceschi.*

BB. *Rachis not abruptly contracted.*

C. *Leaflets flaccid.*

D. *Form of lfts. linear.*

E. *Arrangement of lfts. equidistant.*

Weddelliàna, H. Wendl. Fig. 508. Stem 4–7 ft. high, 1¼ in. in diam., densely covered with persistent sheaths: lvs. equally pectinate-pinnatisect, 3–3¼ ft. long: petiole 8–20 in.: sheath coriaceous-fibrous, glabrous or tomentose, with slender brown hairs, at length evanescent: blade 2–3 ft.: segments about 50 on each side, widely spreading, the middle 5 in. long, 2 lines wide, subequidistant, glaucous beneath: rachis filiform at the apex, brown-scaly. Trop. Braz. R.H. 1879, p. 434. I.H. 22:220. A.G. 16:345.—The most important of small ornamental palms for the north.

EE. *Arrangement of lfts. in groups of 2–4.*

plumòsa, Hook. Stem 30–36 ft. high, 10–12 in. thick, ringed at intervals of a foot, clothed near the apex with remnants of the dead petioles; lvs. erect-spreading, 12–15 ft. long, recurving: petiole ⅓–½ as long as the blade: segments linear acuminate, sparse, solitary or mostly in groups of 2–4, 1½ ft. long, deflexed near the apex. Cent. Braz. B.M. 5180.—The chief avenue palm of the genus. A quick-grower, ultimately 50 ft. high in S. Fla. and Calif.

CC. *Leaflets rigid.*

butyràcea, Linn. Stems very tall, naked: lvs. pinnate; lfts. simple; spathe cylindrical-oblong, 4–6 ft. Venezuela.—Rare and perhaps confused with *Scheelea butyracea*. Little known.

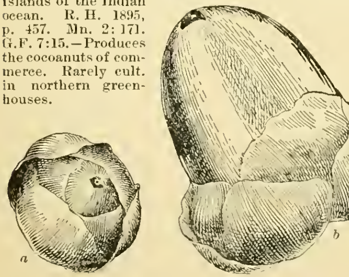
D. *Form of lfts. sword-shaped.*

Romanzoffiàna, Cham. Stems 30–40 ft. high, somewhat fusiform above: lvs. about half as long as the caudex, the withered ones deflexed, pendent, the upper spreading, incurved, segments conduplicate at the base, ensiform. S. Braz., near the sea.

DD. *Form of lfts. linear: apex obtuse: petiole glaucous.*

austràlis, Mart. PINDO PALM. Height 8 ft.: stem erect, columnar, equal, strongly annular above; petiole naked; segments linear, glaucous, rather rigid: fr. as large as a pigeon's egg, outer pulp sweet, edible, seed oily. Paraguay. G.C. III. 18:739. A.F. 5, 515, and 7:805. R.H. 1876, p. 155.—A slow grower. Cult. under glass and outdoors in Fla. and Calif.

nucifera, Linn. COCO PALM. COCOANUT TREE. Figs. 507, 508. Caudex 40–100 ft. high, flexuous, thickened at the base: lvs. 12–18 ft. long; lfts. linear-lanceolate, 2–3 ft., coriaceous, flaccid: petiole 3–5 ft., stout. Seashores within the tropics. Indigenous to Cocos or Keeling Islands of the Indian ocean. R. H. 1895, p. 457. Mn. 2: 171. G.F. 7:15.—Produces the cocoanuts of commerce. Rarely cult. in northern greenhouses.



(Nat. size at this stage.) (Nat. size.)

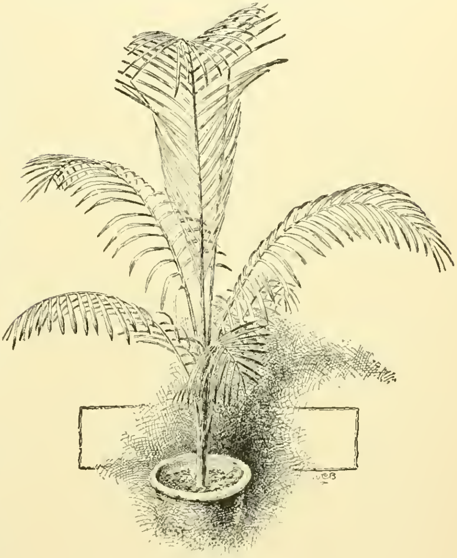
507. Stages in the growth of a cocoanut.

DDD. *Form of lfts. narrowly lanceolate.*

E *Lvs. long, 6–15 ft. in mature specimens.*

F. *Petiole spinose-serrate: segments of leaf less numerous.*

Yatày, Mart. Stem 12–15 ft. high, over 1 ft. in diam., naked below, covered with dead sheaths above: lvs. recurved, spreading 6–9 ft.; sheath 1 ft. long, fibrous at the mouth; petiole 1½ ft. long, spinose-serrate; segments 50–60 on a side, crowded below, then equidistant, linear-lanceolate, the uppermost long-setaceous filiform, the middle ones 2½ ft. long, 2–5 in. wide, the upper 20 in. long, ¼in. wide, all rigid, glaucous beneath. Brazil, Argentina.



508. Cocos Weddelliana.

FF. *Petiole not spinose-serrate: segments of leaf very numerous.*

Dàtil, Drude & Griseb. Stem 30 ft. high, 8–12 in. diam.: lvs. 12–15 ft. long; sheath about 16 in. long; petiole 1½ ft. long, 1⅔ in. wide, ⅔in. thick; segments linear-acuminate, glaucous, densely crowded in groups of 3 or 4, 150–160 on each side, the lowest 2 ft., middle 2⅓ ft. and apical 1 ft., the uppermost filiform, all narrow, stiff and rigid, the dried lvs. glaucous green or whitish. Argentina; islands and river banks. The fruits are edible, resembling those of the date palm. Hardier in S. Calif. than *C. plumosa*, *flexuosa*, and *Romanzoffiana*.

coronàta, Mart. Trunk at length 18–30 ft. high, 8 in. in diam., erect, deeply ringed: lvs. erect-spreading, 6–9 ft. long, short-petioled, arranged in a close, 5-ranked spiral, the long-persistent bases of the petioles forming a spiral-twisted column below the crown; leaf-segments in groups of 2 or 3, folded together from the base (conduplicate), linear lanceolate, acute, coriaceous, densely crowded, about 100 on each side; midrib 4-sided below, 3-sided above. Brazil.

EE. *Lvs. shorter, 3–4½ ft. in mature specimens.*

F. *Apex of lfts. obtuse.*

campéstris, Mart. Stem 8–10 ft. high, thickened, scaly: lvs. spreading-recurved, rigid, 3–4½ ft. long: rachis elevated, triangular above, convex below: segments narrowly lanceolate, 30–40 on each side, obtuse at the apex and shortly cordate-acuminate. Brazil.—Hardier than *C. nucifera*.

FF. *Apex of lfts. acuminate.*

insígnis, Mart. (*Glaziòva insignis*, Hort.). Stem 3–6 ft. high, 1½ in. in diam.: lvs. 4½–6 ft. long; sheath densely brown-lanate; petiole shorter than or equaling the sheath, a fourth or fifth as long as the rachis; segments equidistant, 50 on each side, narrowly lanceolate, obliquely acuminate and caudate, silvery glaucous beneath. Braz.

The following are obscure trade names of rare plants not sufficiently described: *C. Alphónsei, C. Bónneti, C. Gaértneri, C. Maximiliàna* and *C. Yurumàgnas.*

Jared G. Smith and W. M.

CODIÆUM (Malayan name). *Euphorbiàceæ.* Croton of florists. Four or 5 Malayan species of shrubs or trees. Plants monœcious: racemes axillary, long and slender: pistillate fls. with small 5-lobed calyx and no petals, the ovary 3-loculed: stamens 15–30, surrounded by calyx and 5–6 small petals: lvs. alternate and petiolate, normally entire, thick, more or less Aucuba-like. Differs from Croton in the absence of petals from the pistillate fls., and in technical characters of stamens.

The Codiæums of gardens are of many widely different kinds, and many of these forms have Latin-made names. They are all derived, however, from one polymorphous natural group, which J. Müller, the latest monographer (DC. Prodr. 15: pt. 2, 1119), considers to be one species (*C. variegatum*). This plant is widely distributed in the Malayan region, and is commonly planted in the Moluccas and other parts. The Crotons or Codiæums of horticulturists fall into three groups,—those with ovate, short-stalked lvs., those with narrower and spatulate lvs., and those with very narrow and often twisted lvs. These correspond with Müller's three natural divisions:

variegàtum, Linn., var. **pictum**, Müller (*C. pictum*, Hook.). Fig. 509. Lvs. short-petioled, ovate or ovate-lanceolate, more or less cordate at the base, 1½–3 times longer than wide, beautifully and variously marked with red, yellow and green. L.B.C. 9:870. B.M. 3051.

Var. **Moluccànum**, Müller. Fig. 510. Lvs. long- or short-petioled, widely or narrowly spatulate, acute at base, and short-acuminate.

509. Codiæum Baronne de Rothschild (var. *pictum*).

Var. **genuìnum**, Müller (*Cròton variegàtus*, Linn.). Figs. 511, 512. Lvs. broad- or narrow-lanceolate, equally narrowed at both ends, acutish or obtuse, never cordate at base.

The Codiæums of gardens are prized chiefly for the varied and brilliant markings of the lvs. The colors are in shades of red, yellow, orange and purple, and the markings often run into white. The plants have been modified almost endlessly by domestication. Some of the modification is the result of crossing. The Codiæums are prized both as indoor foliage plants and as subjects for massing in the open. In the open air they develop most brilliant colors in our bright, hot summers. The plants will not stand frost. Specimens which are becoming too large for the greenhouse may be placed in the center of the bed for summer and thrown away after frost. With Crotons it is especially desirable to have the ball of roots well developed. The smallest sized plants, which naturally form the outer ring in the summer bed, may be plunged in their pots into the soil, and are easily removed in the fall to the greenhouse. Such plants, when taken up in the fall and brought indoors, should be cut back at the time of potting. They do not make the best subjects for winter decoration, although good results may be got from them by the exercise of care.

L. H. B.

Codiæums (or Crotons, as they are popularly known in America) are beautiful plants, with many forms of handsome and odd foliage of the most brilliant coloring. The colors range from almost pure white to light and deep yellow, orange, pink, red and crimson, in the most charming combinations. In some cases one color predominates, as in Carrierei (yellow), Czar Alexander III. (crimson), Hawkerii (light yellow). These varieties of distinct coloring make beautiful specimen plants for jardinieres; and their beauty is enhanced when used in jardinieres of appropriate color. As exhibition plants they are very effective, and may be grown to specimens 5 or 6 feet high, or even larger. In smaller sizes, Codiæums are much used as table plants, for which purpose well colored tops are rooted and grown on until they are from 12 to 15 inches high. The narrow-leaved varieties are most used for this purpose. Codiæums are also very attractive in vases and window boxes and for mantel and table decorations. They are also very valuable as bedding plants. Planted in clumps or masses, the effect of the combination of rich colors is charming. They should be planted in only good, rich, not too heavy soil, and regularly syringed to keep down red spider. They color best when fully exposed to the sun, and should not be planted out until about the 10th of June in the neighborhood of New York and Philadelphia. If something is needed to make the beds look attractive early in the season, it is a good plan to plant pansies in April, to remain until it is time to plant the Codiæums. Some of the tender varieties, such as Reedii, Albicans, and a few others, are inclined to burn in the extremely hot weather, but nearly all the sorts do well bedded out. Among the very best for this purpose are Queen Victoria, Dayspring, Baron Rothschild, Andreanum, Lady Zetland, Carrièrei, Barryi, Hawkerii, Fasciatum, Anietumense.

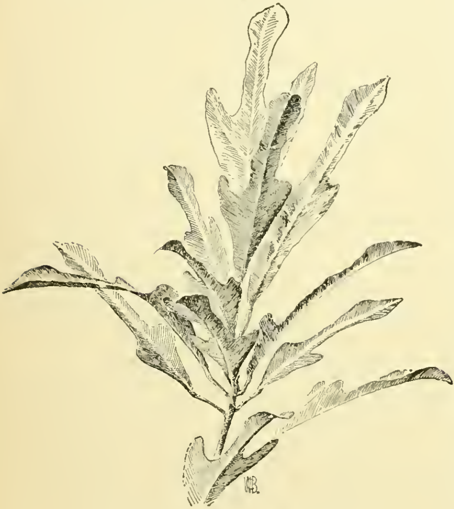
The house culture of Codiæums is very simple. It is necessary that a night temperature be maintained of 70° to 75°, and that the air be kept moist by frequent syringings. Cuttings of half-ripened wood may be easily rooted at any time from October until June, a bottom heat of 80° being just what they need. When very fine specimens are desired, root strong and shapely tops by making an incision in the stem and tying moss around the wounded part; it will be rooted ready to pot in about three weeks. By this method all the foliage may be retained, and a perfect plant be the result. The more light the plant gets, the better will be the color; but with some kinds of glass it is necessary to shade lightly to prevent burning of the leaves. They may be grown finely in a house glazed with ground glass, which admits the light and does not require shading. It is well to syringe two or three times a week with tobacco water, to kill mealy bug and red spider. Little's Antipest, or any emulsion of coal-oil, is a good insecticide for Codiæums. New varieties from seed (the result of crossing existing sorts) are continually being raised. Seed ripens freely under glass in North America, and there is no doubt that the list of about eighty choice varieties now in cultivation will be largely extended in the near future.

The following horticultural varieties are in the American trade:

Aigberth Gem.
Albo-lineatum.

Albicans. Lvs. broad-lanceolate, 18 in. or less long, shining green, variegated ivory-white, tinted crimson beneath: dense grower.

Andreanum. Lvs. broad-oblong, deep green, with yellow and crimson vein-markings. R.H. 1876, p. 234. I.H. 22. 201.



510. Codiæum Disraeli (var. *Moluccanum*).

Angustissimum (angustifolium). Lvs. 1–1½ ft. long, linear, drooping, yellow-margined and -ribbed.

Anietumense.

Aucubæfolium. Lvs. short and broad, green, blotched with yellow and crimson.

Aureo-maculatum. Lvs. long and narrow, yellow-spotted.

Aureum. Lvs. beautifully and symmetrically marked with rich yellow.

Baron Adolph Seillière. Strong and robust growth. Large, brilliant green lvs., with pale yellow nerves, which soon become ivory-white, the contrast of color producing a striking effect.

Baronne de Rothschild (Fig. 509). Lvs. broad, olive-green and yellow, changing to crimson.

Barryi.

Beauty. Lvs. lanceolate, profusely and strikingly variegated with golden yellow on a rich green ground; as they attain age the green ground color gradually becomes a deep bronze, while the yellow variegation develops into a rich, rosy crimson.

Bergmani. Lvs. short, broad-oblong, cream-yellow, with green blotches. I.H. 27: 389.

Brilliantissimum.

Burtonii. Lvs. lanceolate, 16 in. or less, shining green, marbled with golden yellow.

Carrièrei.

Challenger (Imperator). Long lvs.; midribs at first creamy white, suffused with red, deepening to bright carmine. One of the best.

Chelsonii. Lvs. narrow and drooping, more or less twisted, salmon-tinted and -blotched.

Chrysophyllum. Lvs. small, yellow-tinted.

Compte de Germiny.

Cooperii. Lvs. yellow-veined and -blotched, changing to red.

Cornutum. Lvs. oblong and obtuse, lobed, rounded at the base, wavy-margined, dark, shining green and mottled with yellow, the midrib projecting at the tip.

Cronstadtii. Lvs. lanceolate, twisted and crisped, tapering to a sharp point, glossy green, variegated with light golden yellow.

Crown Prince. Lvs. lanceolate and acuminate, 18 in. or less long, shining green, with golden veins.

Czar Alexander III.

Dayspring. Orange-yellow, edged green and tinged red.

Delight. Lvs. oblong acute, bright yellow, margined with green, the veins cream-color, the bright central variegation changing to clear ivory-white, with here and there a few dots of the same color scattered through the margin of the leaf.

Disraeli (Fig. 510). Lvs. rather narrow, variously lobed, dark green, with yellow veins, changing to crimson.

Dodgsonæ. Lvs. lance-linear, 1 ft. or less long, sometimes twisted, green, with golden rib and margins.

Earlscourt.

Elegans. Lvs. linear-lanceolate, but short (about 6 in.), green above, with yellow or crimson rib and margins, dull green and mottled purple beneath.

Elegantissimum. Lvs. narrow, of considerable length; variegation of a rich, bright golden color, which contrasts strongly with the bright red tint of the petioles, producing a very pretty effect.

Evansianum. Lvs. 3-lobed, veined with yellow and mottled with yellow, bronze and orange.

Excelsior.

Fasciatum. Deep green, with yellow veins.

Flambeau.

Flamingo.

Gloriosum (Prince of Wales). Lvs. long, narrow and drooping, variously spotted with creamy yellow.

Golden Ring.

Goldiei. Lvs. spatulate, 3-lobed, 12 in. or less long, olive-green, with golden veins.

Grande. Dark green, with yellow spots.

Hanburyanum. Lvs. oblong, 18 in. or less, olive-green, with golden and rose markings.

Harwoodianum (Triumphans Harwoodianum). Lvs. oblong, ribbed with gold and crimson.

Hawkerii. Lvs. broad-lanceolate, ½ ft. long, light yellow, with green margins.

Henryanum. Lvs. ovate-oblong and pointed, 10 in., mottled or overspread with golden yellow.

Hilleanum. Lvs. broad-oblong or spatulate, 9 in. or less, wavy-margined, purplish green, marked with crimson.

Hookerianum. Lvs. lance-ovate, dark, shining green, with golden blotches.

Illustris. Lvs. with 3 narrow-oblong lobes, golden barred and variegated.

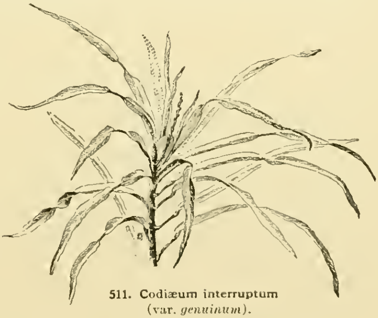
Imperator. See Challenger.

Interruptum (Fig. 511). Lvs. very narrow, with notched places, twisted, with crimson rib.

Irregulare. Lvs. oblong and tapering at base, contracted below the middle, acute at apex, shining green, with yellow spots and ribs.

Jamesii. Lvs. ovate, 10 in. or less, dark green, irregularly blotched with whitish and yellow.

Johannis. Lvs. linear-lanceolate, tapering at each end, channelled above, ribbed and margined yellow. A.F. 13: 1070.



511. Codiæum interruptum (var. *genuinum*).

Katoni. Lvs. lanceolate, bright green, with circular yellow spots.

Lady Zetland. Graceful habit.

Lord Derby.

Macfarlanei. Lvs. linear-lanceolate, drooping, 1 ft. long, green and yellow blotched, but becoming bright crimson.

Magnolifolium.

Majesticum. Lvs. narrow and long, mottled green and yellow, and shaded with crimson.

Marquis de Castellane.

Mortfortiense.

Mortii.

Mrs. Chas. Heine.

Mrs. Dorman. Lvs. linear-lanceolate, 1 ft., with scarlet rib and green margins.

Mrs. H. F. Watson. Large-lvd.: green, but as they mature the green deepens and changes to a bright, bronzy crimson, striped, spotted and blotched with rich golden yellow and edged with salmon, the midribs and veins bright red.

Mrs. Swan. Lvs. broad-lanceolate and acuminate, golden yellow in the center and on the margins and petiole.

Multicolor. Lvs. like Irregulare, but blotched and veined with yellow, changing to orange and crimson.

Musaicum. Lvs. oblong-lanceolate, wavy, acuminate, green, crimson and cream-color. R.H. 1882: 240.

512. Codiæum spirale (var. *genuinum*).

Nestor. Lvs. large, lanceolate, with a broad crimson midrib, spotted margin, and bright yellow central variegation.

Nevilliæ. Lvs. oblong-lanceolate, barred and marked yellow, changing to orange and metallic crimson.

Nobile.

Orvilla.

Ovalifolium.

Pictum. Lvs. broad-oblong and acuminate, less than 10 in. long, crimson, with irregular blotches of green and blackish. Old but good. B.M. 3051.

Picturatum. Lvs. similar to Interruptum, highly colored.

Pilgrimii. Lvs. ovate and pointed, 10 in., green, overspread with pink, golden-blotched.

Prince of Wales. See Gloriosum.

Princeps. Lvs. broad-linear, with yellow rib and margins, the green becoming bronze and the yellow becoming crimson.

Princess Matilda.

Punctatum.

Queen Victoria. Lvs. oblong-lanceolate, 12 in. or less, golden yellow blotched and magenta ribs.

Recurvifolium. Lvs. broad and heavy, recurved, veined with crimson and yellow, and handsomely blotched.

Reedii.

Roseo-pictum.

Ruberrimum. Lvs. crimson, narrow, drooping, marked with creamy white.

Rubro-lineatum.

Rubro-striatum.

Senitzianum.

Sollerii.

Spirale (Fig. 512). Lvs. long, narrow-oblong, twisted, striped and marked with yellow, changing to crimson.

Stewartii. Lvs. obovate, blunt at base, olive green, with reddish rib and petiole and orange bands and margin.

Sunbeam. Dark, bronzy lvs., from 9 to 10 in. long and about 2 in. wide, in the young state freely blotched with yellow, gradually changing into rosy crimson, which in turn, as the leaf arrives at maturity, becomes of a rich blood-red.

Sunshine.

Superbissimum.

Thompsonii.

Tricolor. Lvs. oblong-spatulate, very acute, gradually tapering from the upper third to the base; margin sinuous; upper surface dark, shining green, central part and midrib golden yellow, lower surface dull, reddish green.

Triumphans. Lvs. oblong, deep green and crimson, changing to greenish bronze and rosy crimson.

Undulatum. Lvs. broad and long, undulated or crimped, with claret, crimson and purplish veins.

Victory. Lvs. of deep orange-yellow, blotched with crimson, changing with age to deep olive-green, with crimson veins and costa, and a blotching of red.

Veitchii. Lvs. lance-oblong, rounded at base, bright green, mottled yellow and crimson. R.H. 1867, p. 190.

Volutum. Lvs. broad, rolled at tip, golden veined.

Warrenii. Lvs. linear-lanceolate, 2–3 ft. long, twisted, drooping, overspread and mottled with orange and crimson, changing to crimson.

Weismanii. Lvs. lance-linear, 12 in. or less long, very acute at tip, more or less undulate-margined, shining green and golden-blotched.

Williamsii. Lvs. ovate-oblong, 1½ ft. or less long and 4 in. or less broad, undulated, magenta, crimson and yellow.

Wilsonii. Lvs. linear-lanceolate, 1–2 ft., drooping, bright green, overspread with yellow.

Youngii. Lvs. long, nearly 1 in. wide, dark green, irregularly blotched with yellow and rose-red. ROBERT CRAIG.

CODLIN, or CODLING. Used in England to mean a small, green, half-wild, inferior apple. It is used in distinction from grafted or dessert fr. It is about equivalent to our use of the word "crab."

CŒLIA (Greek, *koilos*, hollow: referring to the pollen masses). *Orchidàceæ*, tribe *Vándeæ*. Six species of central and South American epiphytic orchids, divided into 2 strongly marked groups with widely different kinds of inflorescence. *C. macrostachya* is a type of the first section, with long racemes of numerous small, horizontal fls., which are much exceeded by the long spreading bracts, and the base of the column short. *C. bella* is typical of the second section, with the fls. few, larger, erect, in groups of about 3, longer than their bracts, and the base of the column produced to twice its own length, which gives the fls. a tubular appearance. Cœlias are of minor importance. They grow best in pots of peat and sphagnum, with a little charcoal.

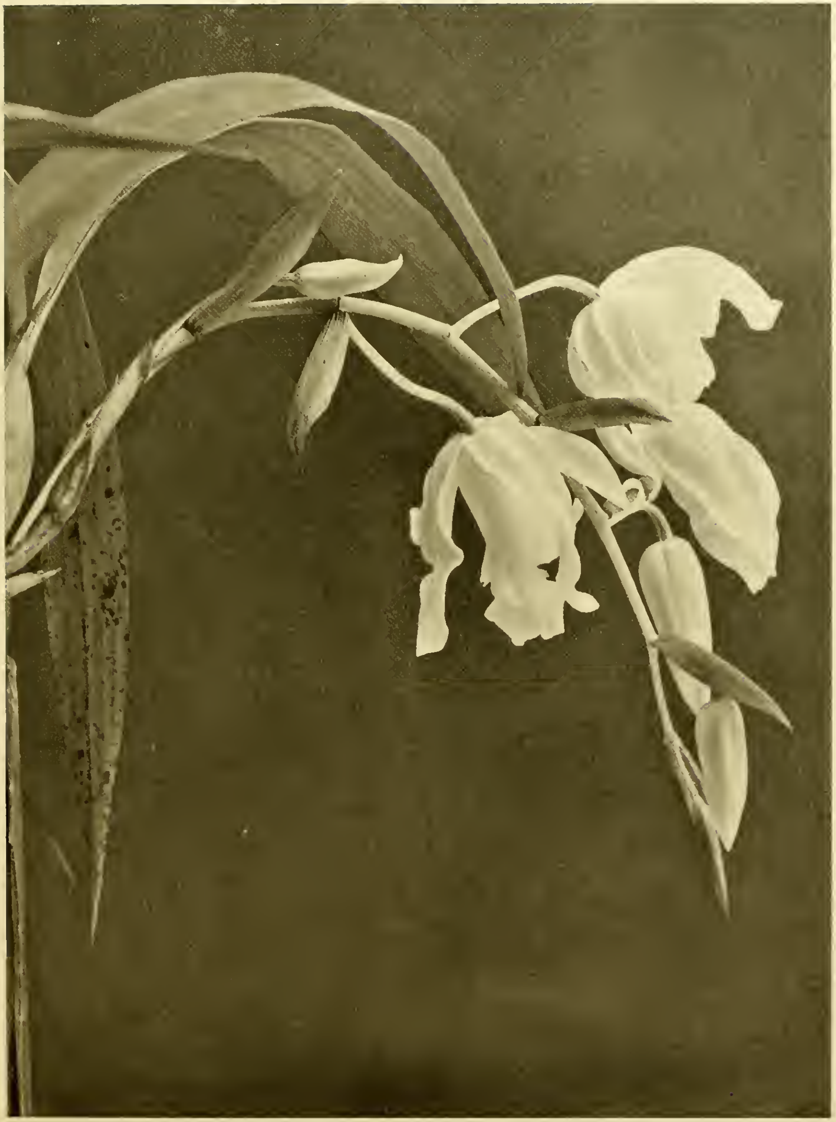
A. *Fls. rosy red, numerous, small, in a long raceme.*

macrostàchya, Lindl. Pseudobulbs 2½ in. long, almost round, with brown scales at the base: lvs. about 3, from the top of the pseudobulb, 1 ft. or more long, lanceolate, arching, broader than in *C. bella*, and not channeled: sepals red; petals white. Mexico. R.H. 1878: 210. B.M. 4712 shows a dense raceme 8 in. long, with more than 75 fls.

AA. *Fls. white, tipped purple, few, large.*

béllа, Reichb. f. Pseudobulbs smaller and more constricted at the top: lvs. 6–10 in. long, narrower, channeled above, arching: fls. 2 in. long, erect, 3 or 4 in number, with the midlobe of the lip orange-colored. Guatemala. B.M. 6628.

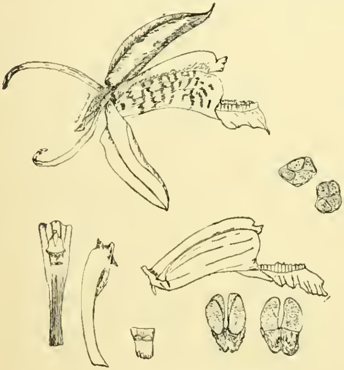
CŒLÓGYNE (hollow pistil). *Orchidàceæ*, tribe *Epidéndreæ*. A genus of useful plants, all pseudobulbous, found in tropical Asia growing on trees and on rocks. Sepals and petals membranaceous, labellum large, cucullate with 2, 3 or more longitudinal ridges; column erect, winged, membranaceously margined at and toward the apex; pollinia 4. The botanical details of *Cœlogyne speciosa* are shown in Fig. 513. At the top is a general



Cœlogyne cristata, one of the popular and easily grown orchids

view of the flower. Below, on the left, is the column, front and side view. In the center is the lip, with the column lying along its top. Below the lip, on the left, is the stigma. To the right, on the bottom row, are the pollinia, front and back view; and at the right center are separate pollen masses.

Cœlogynes may be grown in pots, pans or baskets, but it is hardly advisable to undertake growing them on blocks, as they are a thirsty class of plants when growing, and, in fact, when at rest should not be allowed to become very dry. Cœlogynes, as a rule, do not care to be disturbed; therefore, it is a good plan not to repot until the plants have outgrown the pots or baskets, or the old compost has become exhausted. They should be potted then in a compost consisting of equal parts fresh sphagnum moss and fibrous peat, to which may be added a little broken charcoal. The pots or baskets to be used should have a good supply of crocks, so that the water may pass away freely, otherwise the compost would soon become sour. A good time to repot or top-dress is just after the flowering season. When repotted, the plants should be kept in a rather moist, shady place until the new roots commence to take hold of the fresh compost. They may then be put in their growing quarters and given a good supply of water all through the growing season; but after the growth is completed they will require only enough water to keep the bulbs in a plump condition. Manure water applied once a week when growing will be found beneficial, but should be given in a weak form to begin with.


513. Details of Cœlogyne speciosa.

There are about 50 kinds of Cœlogynes, a number of which are well worth a place in the most select collections. One of the most beautiful species is *C. cristata*, with its varieties *hololeuca*, *Chatsworthii*, *Lemoniana* and *maxima*. To insure a good crop of fls., the above should all have a good supply of light and air when growing, only a very light shading being necessary. They also may be syringed overhead once or twice a day in bright weather to keep down red spider and other insect pests. In the winter they may be rested in any cool greenhouse in which the temperature does not fall below 40°. *C. corrugata*, *C. flaccida*, *C. ocellata* and *C. Massangeana* will all do nicely in an intermediate house, while *C. Dayana* and *C. Sanderiana* should be grown in a warmhouse where the night temperature in winter is not below 60°. Cœlogynes may be propagated by dividing the plants, always being careful to get one or more leading growths with each piece.

Cult. by Albert J. Newell.

A. *Racemes pendulous or drooping.*

B. *Fls. green or yellow.*

panduràta, Lindl. Fls. large: sepals and petals green, labellum fiddle-shaped, with black veins and stains on a yellowish green ground; central disk 3-ribbed; pseudobulbs oval oblong, 4 in. long; lvs. rather oblong, 15 or more in. in length: racemes many-fld. Borneo. B.M. 5084. F.S. 20:2139. J.H. III. 30:377. A.F. 6:633.

Dayàna, Reichb. f. Pseudobulbs pyriform, cylindric, about 6 in. long: lvs. oblong-lanceolate: fls. numerous; sepals and petals pale yellow, margins reflexed; petals much narrower than sepals; labellum with 6 erect ridges fringed with brown: racemes 2 ft. or more long. Borneo. G.C. III. 15:695.

Massangeàna, Reichb. f. Pseudobulbs pyriform, about 3½–4 in. long, lvs. elliptical, large, tapering toward the base; the long racemes many-fld.; sepals and petals equal, pale yellow, lateral lobes of labellum brownish within, lined or streaked with yellow; mid-lobe with a verrucose brown and yellow disk: raceme sometimes 2 ft. long. Assam. B.M. 6979.

BB. *Fls. white or cream-colored.*

cristàta, Lindl. A free-flowering species, with large white flowers: sepals and petals lanceolate-oblong, undulate; lateral lobes of labellum slightly incurved; mid-lobe provided at the center with 5 bright yellow fringes and 3 ridges. Nepal. J.H. III. 31:349. P.G. 1:55. A.G. 14:331; 15:513. A.F. 4:497; 6:87; 9:1111; 13:1133. F.E. 9:331. Gng. 2:393; 4:225.—Var. **hololeùca**, Hort. (var. *alba*), has white fls., labellum without yellow. Var. **Lemoniàna**, Hort., has citron-yellow fringes. Var. **Chátsworthi**, Hort., has large pseudobulbs and large fls. of good substance. Var. **máxima**, Hort., has very large fls. *Cœlogyne cristata* is one of the best and most popular of orchids. It is one of the easiest to grow. Can be grown with Cattleyas.

fláccida, Lindl. Pseudobulbs ovate, angulate, 2–3 in. long lvs. lanceolate, about 8 in. long: raceme 7–10-fld., often more: fls. 1½ in. across: sepals and petals whitish: labellum with 3 ridges, bright yellow blotch on the disk. Nepal. B.M. 3318.

Gardneriàna, Lindl. Pseudobulbs long and tapering, flask-shaped: lvs. 2, thin, 18 in. or less long: raceme many-fld.: fls. large, long-petaled, pure white except the lemon-yellow lip, not opening wide. Ind. P.M. 6:73.

asperàta, Lindl. (*C. Lówii*, Paxt.). Large species (18–24 in. high): pseudobulbs large and oblong, each bearing a pair of broad, dull green lvs.: raceme 1 ft. long, many-fld.: fls. 3 in. across, cream-colored, but the lip with an orange crest and radiating brown and yellow streaks. Borneo. P.M. 16:227.

Sanderiàna, Reichb. f. Pseudobulbs ovate and wrinkled or costate, 2 in. long, each bearing a pair of lvs. a foot long: fls. about 6 in a raceme, 3 in. across, snow-white; sepals narrow and pointed, keeled; petals broader; lip 3-lobed, the side lobes striped with brown and the middle lobe blotched with yellow. E. Ind.—Distinct and handsome. **C. Sánderæ**, Kränzlin (G.C. III. 13:361. J.H. III. 35:451), is probably the same. It is described as having the "disk of the lip deep orange in front, much paler behind, and with three parallel keels, covered with long dark hairs" (G.C. III. 13, p. 392).

AA. *Racemes erect.*

barbàta, Griffith. Pseudobulbs about 2 in. long, ovate: lvs. broadly lanceolate, about 1 ft. long: fls. large, petals linear, whitish; sepals ovate-oblong, white; mid-lobe of labellum brownish inside, curiously fringed with brown; crests 3. Khasia hills.

ocellàta, Lindl. Pseudobulbs pyriform or nearly so: lvs. about 1 ft. long, narrowly lanceolate; racemes 6 in. long: fls. large, white, with two bright orange-yellow spots on each of the lateral lobes of the labellum, and two smaller spots at the base of the midlobe; also brown lateral streaks; column bordered with yellow. E. Ind. Found at an elevation of 7,000 feet. B.M. 3767.

speciòsa, Lindl. Pseudobulbs ovoid, distinctly angled, 2 or 3 in. long, monophyllous; racemes short: fls. 1, 2 or 3, on short peduncles, which emerge from imbricated scales directly below the fls.; sepals oblong-ovate, translucent, dull salmon-pink; petals linear reflexed; lateral lobes of labellum erect, slightly incurved, reticulated, with dull copper-brown on a blush-salmon ground, midlobe roundish, partly broad-margined with white, disk with two fringed ridges and umber-brown markings. Inner surface of column brownish. Java. B.M. 4889. Gn. 49, p. 62.

corrugàta, Wight. Pseudobulbs ovate-pointed, in tufts, with lvs. 3 in. long: racemes 3–6-fld.: fls. white; sepals and petals nearly equal, oblong and acute; lip 3-lobed, the lateral lobes smaller and blunter than the central one. E. Ind. B.M. 5601.

Párishii, Hook. f. Like *C. pandurata*, but racemes not drooping, the pseudobulb 4-angled and narrow, bearing a pair of stout broad lvs., the fls. about 6, and smaller. A small species. Burma. B.M. 5323.

Fœrstermanni, Reichb. f. Pseudobulbs cylindrical or fusiform, producing 1- or 2-sheathed peduncles from the side: fls. large, snow-white; sepals and petals lanceolate, the former keeled outside; lip 3-lobed, the middle lobe rounded and minute-pointed, the side lobes rounded, the disk marked with yellowish brown: lvs 3–4 in. wide and 18 in. long, very short-stalked. E. Ind.

Oakes Ames.

COFFÈA (from the Arabian name for the drink, itself conjecturally derived from Caffa, a district in southern Abyssinia). *Rubiàceæ*. A genus of about 20 Old World species, mostly natives of tropical Africa. Shrubs or small trees, usually glabrous, with slender branches: lvs. elliptical, pointed, glossy, coriaceous, mostly opposite, rarely in whorls of 3: fls. creamy white, tuberose-like, delicately fragrant, subsessile, clustered in the axils of the lvs. The genus is technically distinguished by the short calyx limb: corolla throat villous or glabrous: style branches 2, linear. The fr. is a berry containing 2 horny seeds, which afford the Coffee of commerce. For Coffee production, two species, *C. Arabica* and *C. Liberica*, are now extensively cultivated throughout the tropics, and are occasionally to be found in conservatories; also in gardens in Florida and California.

The Coffee of commerce consists of the seeds of these two species of Coffea, *C. Arabica* and *C. Liberica*, the cultivation of which is one of the most important agricultural industries of the tropics, the annual production reaching 1,500,000,000 pounds, valued at $150,000,000. Of this amount, Brazil furnishes over 70 per cent. A new Coffee from the Congo is receiving much attention in Europe,—*C. Maragogipe*. It is very vigorous growing. W. M.

Climate and soil.—Although *C. Arabica* will endure a low temperature, and has, with slight protection, survived the winter in Germany, successful commercial culture requires a rainfall of from 100–150 in. and an equable temperature, having an average minimum of not less than 60°. The Liberian species is at home under thoroughly tropical conditions, and endures exposure to the sun at low elevations, where for *C. Arabica* shade trees are commonly supplied. Coffee thrives in a great variety of soils, but those containing a large amount of humus are preferable and volcanic deposits are also excellent. The use of fertilizers is increasing, but the requirements of particular localities must be carefully considered.

Cultivation.—The seed germinates in from 4 to 6 weeks after ripening, and will endure only partial drying. Seedlings are raised in shaded seed-beds or flower-pots, whence they are transplanted at the beginning of the rainy season, preferably when 2 years old, to their permanent places. The distance between trees is determined by the soil and climatic conditions, varying from 6 ft. for *C. Arabica*, under circumstances unfavorable to the growth of wood, to 15 ft. or more for *C. Liberica* in fertile ground. For the reception of the seedlings, large holes are dug in order to insure loose soil and avoid injuring or bending the long tap-root. Subsequent culture consists largely in the frequent removal of all weeds, by means of hoes or other implements, which also stir the surface soil. Trees are headed or pruned to a height of from 3–6 ft. in order to keep the berries within easy reach, and after each harvest the old twigs are removed, also the epiphytes and parasites. Spraying with fungicides and insecticides is also practiced when necessary.

Harvest.—Production begins, under favorable circumstances, the second or third year from transplanting, but a paying crop can scarcely be expected before the fifth or sixth year. The berries ripen unevenly, requiring two or more visits to each tree. The yield is estimated in general at 1 pound of dry Coffee per tree, but careful methods increase this to 3 or 4 pounds, while in exceptional cases from 6 to 12 and even 25 pounds have been reported. The life of the Coffee tree has been stated at 20 or 30 years, but with good care production may be maintained for 50 years or more. The berries may be dried as picked and the seeds afterward extracted by machines called "hullers;" or, by means of a "pulper," the outer fleshy material is removed before drying. For the latter process, running water, cisterns, buildings and machinery are necessary. After being "pulped," the Coffee is fermented in order to further disintegrate the saccharine matter of the external coat; it is then dried in the sun or by artificial heat, after which the tough inner integument, the so-called "parchment," is removed by other machines and the "beans" are polished, graded and sent to the market.

In all of the recently acquired tropical territories of the United States, Coffee culture may become an important industry, the excellence of the Porto Rican product being already well known. From the agricultural standpoint, little has been attempted in the selection of superior seed or the application of scientific methods of propagation. Grafting has recently been accomplished in Java.

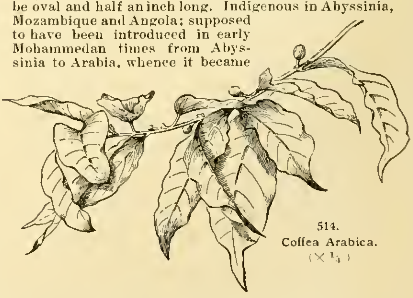
Books.—Coffee, Its Culture and Commerce, edited by C. G. Warnford Loch, 264 pages, 1888, contains a compilation of nearly all the literature then existing, but the article in German in Semler's Tropische Agrikultur contains more recent and original matter. A French work, Culture du Caféier, by C. Raoul, Paris, 1897, is the latest important contribution to the subject.

O. F. Cook.

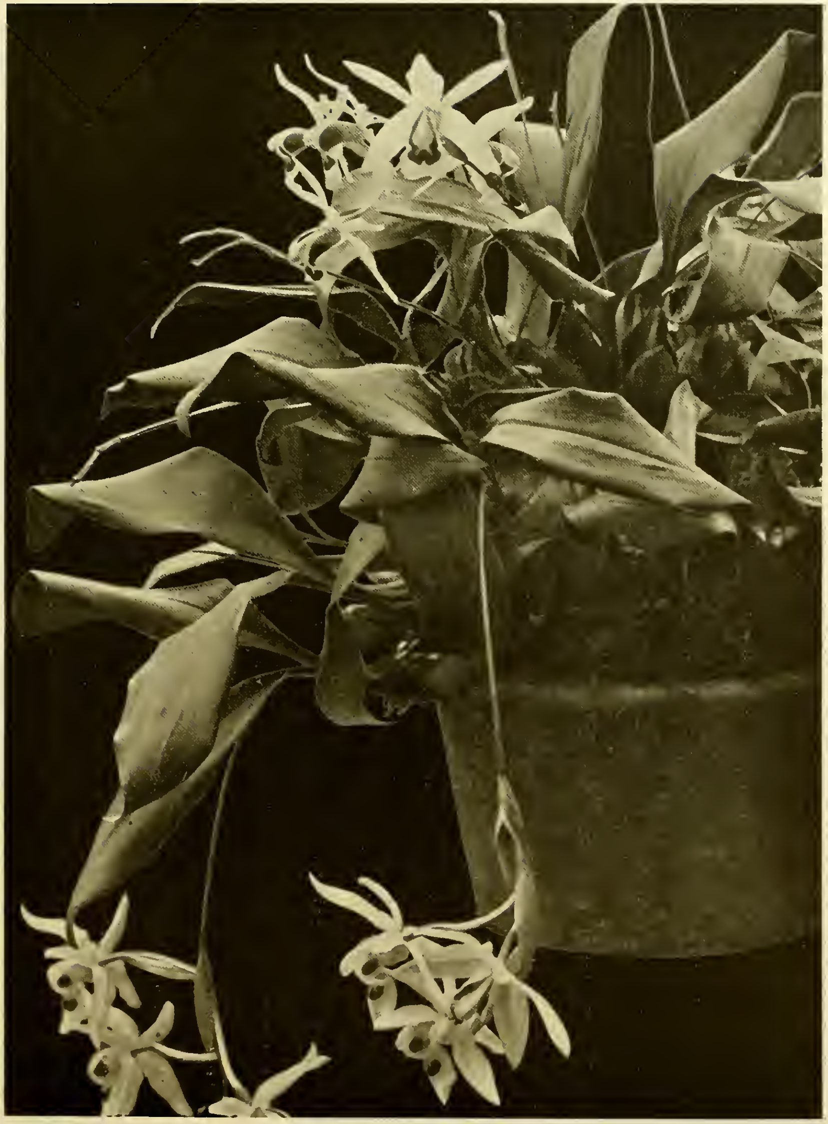
A. *Corolla 5-parted, sometimes 4-parted.*

B. *Segments of corolla narrow: lvs. oblong, 4–5 in. long, 1½ in. wide.*

Arábica, Linn. Common or Arabian Coffee. Fig. 514. Lvs. 3–6 in. long, rather thin, oblong, nearly three times as long as broad, more or less abruptly contracted near the apex to a point about ½ in. long: fls. in axillary clusters of 3–5; segments of corolla four times as long as wide: fr. a 2-seeded, deep crimson berry, but the "berries" or beans of commerce are the seeds. The commercial varieties of Coffee are based largely on the size, shape, color and flavor of the seeds, and hence the fr. is very variable, but the typical fr. may be considered to be oval and half an inch long. Indigenous in Abyssinia, Mozambique and Angola; supposed to have been introduced in early Mohammedan times from Abyssinia to Arabia, whence it became known to Europeans in the sixteenth century. This species furnished until recently the entire commercial product. B.M. 1303. Gng. 6:55.—As it grows wild in Afr. it is a small tree 10–15 ft. high, with the trunk 9–12 in. thick at the base, and with horizontal or even nodding branches, which in old age become one-sided. Often cult. under glass in the north for its economic interest, and in S. Calif. it is a good outdoor ornamental shrub, esteemed for its shining lvs., fragrant white fls., and red berries.



514. Coffea Arabica. (× ¼)



Cœlogyne ocellata, one of the popular orchids

BB. *Segments of corolla wide: lvs. ovate.*

Bengalénsis, Roxb. BENGAL COFFEE. Lvs. ovate, barely twice as long as broad, acute, but not having a long, abrupt point: fls. in 2's or 3's; segments of corolla barely twice as long as wide. E. Ind., Malaya. B.M. 4917.—This has much showier fls. than *C. Arabica*. A small shrub with glabrous, dichotomous branches. A native of the mountains of northeastern India, whence it was brought to Calcutta and much cult. there for a time. It is now neglected, the berries being of inferior quality and the plants not productive enough.

AA. *Corolla 6-, 7-, or 8-parted.*

B. *Fls. in dense clusters or glomes: lvs. short-pointed, 6–12 in. long.*

Liberica, Hiern. LIBERIAN COFFEE. Lvs. longer than in *C. Arabica*, and wider above the middle, with a proportionately shorter and less abruptly contracted point: fls. 15 or more in a dense cluster; corolla segments usually 7. Trop. Afr. Trans. Linn. Soc. II. 1:171 (1876). G.C. II. 6:105. R.H. 1890, pp. 104, 105.—Said to be more robust and productive than *C. Arabica*, with berries larger and of finer flavor. It is a more tropical plant than the common Coffee, and can be grown at much lower levels. "It is a small tree, similar in general to *C. Arabica*, but of more vigorous and upright habit, and larger in all its parts. Lvs. 6–12 in. long: corolla 6–8-parted: berries dull crimson, larger, more numerous, and more nearly spherical than those of most forms of *C. Arabica*. In its native forests in W. Afr. it attains a height of 30 ft. or more, and flourishes near sea level. Owing to its greater size, vigor and productiveness, it is now being extensively planted in coffee-growing regions, particularly in the E. Ind., where it has been found resistant to a rust fungus, *Hemileia vastatrix*, which had destroyed the plantations of *C. Arabica*. In cultivation, both species are pruned low to facilitate the picking of the berries."—*O. F. Cook.*

BB. *Fls. solitary or in 3's: lvs. long-pointed, 2½–5 in. long.*

stenophýlla, G. Don. Lvs. 4–6 in. long, 1–1½ in. broad, narrower than in *C. Arabica*, with a relatively longer and more tapering point: corolla segments usually 9. W. Afr. B.M. 7475.—This is said to yield berries of even finer flavor than the Liberian Coffee, and quite as freely, but the bush is longer in coming into bearing. This is a promising rival to the *C. Arabica* of commerce. Seeds have been distributed by British botanical gardens, but are not known to be for sale at present in America. W. M.

COFFEE. See *Coffea.*

COFFEE BERRY. A name of *Glycine hispida*, which should be abandoned in favor of Soy Bean.

COFFEE PEA. A western name for the Chick Pea, *Cicer arietinum*, which is used as a substitute for coffee.

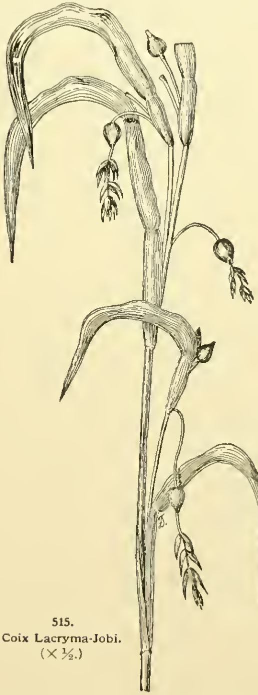
COHOSH. See *Actæa*. The Blue Cohosh is a Caulophyllum.

CÒIX (old Greek name). *Gramíneæ*. A genus somewhat closely related to Indian Corn, and similar to it in leaf structure. A hardy annual, 2–3 ft. high, with broad lvs. and a curious nodding inflorescence. The female fls. are inclosed in a nearly globular, capsule-like covering, which is very hard. This capsule (or involucre) is at first green, then a jet black, becoming nearly white with age. Southern Asia.

Lácryma-Jòbi, Linn. JOB'S TEARS. TEAR-GRASS. CORN-BEADS. Fig. 515. So called from the resemblance of the inflorescence to a tear-drop. In cult. as an ornament or as a curiosity. In India it is cultivated for food by some of the hill tribes of that country. Var. **aûrea zebrìna**, Hort., has yellow-striped lvs. P. B. KENNEDY.

CÒLA (native name). *Sterculiàceæ*. COLA. Also called Kola, Korra, Gorra. This genus of perhaps 14 species of tropical African trees is chiefly interesting for the Cola nuts, which are said to sustain the natives in great feats of endurance. The tree grows on the east coast of Africa, but is very abundant on the west coast, and is now cultivated in the West Indies. Within the tropics the trade in this nut is said to be immense. It has lately become famous in the U. S. through many preparations for medicinal purposes and summer drinks. The seeds are about the size and appearance of a horse chestnut, and have a bitter taste. Although repeatedly introduced to Kew, England, the plant never flowered there until 1868. Consult Stewart's Monograph on Kola.

Colas are tropical African trees, requiring a rich, well-drained soil. Those introduced into West Indies and other parts of America, especially *C. acuminata*, thrive best on a sandy loam. The trees are grown from seeds, which are large and fleshy, keeping well for some weeks after ripening. As the tree is difficult to transplant, the seeds may be planted singly in small pots, and the young trees kept growing thus until wanted for permanent planting. Propagation may also be effected by cuttings of ripe wood, which should be placed in bottom heat, and treated in the usual way.



515.
Coix Lacryma-Jobi.
(× ½.)

acuminàta, Schott and Endl. About 40 ft. high in Africa, resembling an apple tree: lvs. alternate; petiole ½–6 in. long; blade 4–6 in. long, leathery, with prominent ribs below; older lvs. entire, obovate, acute; younger lvs. often once or twice cut near the base about half way to the midrib: fls. yellow, 15 or more in a cluster, about 1 in. across, with a slender green tube and a showy yellow, 6- or 5-cut limb, which is a part of the calyx, as the petals are absent in the tribe Sterculiæ. B.M. 5699. E. N. REASONER and W. M.

COLAX. Now referred to *Lycaste.*

CÓLCHICUM (from Colchis, a country in Asia Minor). *Liliàceæ.* MEADOW SAFFRON. AUTUMN CROCUS. A tribe of fall- (rarely spring-) blooming bulbous plants. Perianth crocus-like but much larger, long and tubular, varying from rosy purple to white, with one yellow-flowered species: lvs. long and broad, appearing in early spring and dying down in June: stamens six; styles three and very long; ovary a round, 3-celled pod: corm long, solid, with a brittle skin. "Colchicum root" and seed are employed in gout and rheumatism. They are narcotic poisons. Colchicums are natives of Europe and the Mediterranean region. They are most charming and interesting plants of easy culture. The bloom comes in August and September, at a season when the herbaceous beds begin to lose their freshness, and, although individual flowers are fugacious, others follow in quick succession, thus prolonging the time of flowering. Opening, as they do, without foliage, some help is required from the greenery of other plants; for this purpose any low-growing, not too dense kind, can be used, such as the dwarf Artemesias, Sedums, *Phlox subulata*, etc. Colchicums are most effective in masses, which can be established by thick planting, or as the result of many years' growth. They can be grown in rockwork, in beds, or in grass which is not too thick nor too often mown; they will thrive in partial shade, but succeed best in an open, sunny border. They should be planted in August or early September, in deep, well-enriched soil, a light, sandy loam, with the tip of the long bulbs 2 to 3 inches below the surface; some protection should be given in winter. They remain in good condition for many years, and should not be disturbed unless they show signs of deterioration, fewer flowers and poor foliage. Then they should be lifted and separated, just after the leaves die, end of June or early July. This is the usual method of propagation, but they can also be increased from seeds, sown just after ripening, June–July; the seedlings may not appear until the following spring. Seedlings bloom when 3 to 5 years old. The bulbs are obtainable from the Dutch growers at moderate prices, and they must be imported early; otherwise they are apt to bloom in the cases. *C. autumnale*, with rosy purple flowers, is a well-known and the most commonly cultivated species. There are numerous varieties, of which the best are the white, the double white and the double purple. Belonging to this same group and not differing much except in size and shading of the flower, are *C. Byzantinum*, *C. montanum*, and *C. umbrosum*. *C. speciosum*, a native of the Caucasus, is the finest in every way of the genus. The flowers are much larger and of better shape, and the color, a rosy pink, is much more delicate; the habit of growth is robust, and the plant is most easily handled.

C. Parkinsoni (a form of *C. variegatum*) is distinct from the above varieties inasmuch as the flowers are tessellated, purple and white, giving a curious checkerboard appearance which is unique; the leaves are much smaller and are wavy. *C. Aggripinum*, *C. Bivonæ*, *C. Cilicicum* and *C. Sibthorpi*, are other species having checkered flowers more or less similar to Parkinsoni. *C. Bulbocodium*=*Bulbocodium vernum*. Monograph by J. G. Baker in Jour. Linn. Soc., vol. 17 (1880).

B. M. WATSON.

Alphabetical list of species described below: Aggripinum, 5; alpinum, 13; autumnale, 10; *Bertolonii*, 1; Bivonæ, 6; Byzantinum, 9; *Cilicicum*, 9; luteum, 3; montanum, 1; *Parkinsoni*, 4; Sibthorpi, 7; speciosum, 8; Steveni, 2; Troodi, 11; umbrosum, 12; variegatum, 4.

A. *Blooming in spring: lvs. appearing with the fls.*

B. *Color rosy lilac: size of anthers small.*

C. *Anthers oblong, purple.*

1. **montànum**, Linn. (*C. Bertolònii*, Stev.). An important and variable species, with many synonyms and variations. Baker makes 7 forms. Corm ovoid, 1–½ in. thick, the tunics brown, membranaceous, the inner ones produced to a point 2–4 in. above the neck: lvs. 2–3, rarely 4–6, linear or lanceolate, about 2–3 in. long at the time of flowering, finally 6–9 in. long: fls. 1–4, in spring and autumn. Oct.–June. Mediterranean region, from Spain to Persia. B.M. 6443.—It appears in early spring with the snowdrops and crocuses.

CC. *Anthers linear, yellow.*

2. **Stèveni**, Kunth. Corm narrower than in No. 1, about ½–¾in. thick: lvs. at length 4–5 in. long: fls. Oct.–Jan. Syria, Arabia, Persia.—Less popular than No. 1.

BB. *Color yellow: size of anthers large.*

3. **lùteum**, Baker. This is the only yellow-flowered form in the genus, all the others ranging from purple to white. Although it belongs to the Mediterranean group, with lvs. and fls. produced at the same time and in spring, it is a native of western India at an elevation of 7,000–8,000 ft. Corm tunics dark brown, sometimes almost black: lvs. 3 or 4, wider and less tapering than in No. 1, at the time of flowering 3–4 in. long, finally 6–7 in. long. B. M. 6153.—Not advertised in American trade, but very desirable.

AA. *Blooming in autumn: lvs. appearing after the fls.*

B. *Perianth tessellated or checkered*

C. *Tessellation distinct.*

D. *Lvs. spreading or prostrate.*

4. **variegàtum**, Linn. Lvs. 2–3, lanceolate, about 6 in. long, 12–15 lines wide, lying flat on the ground; margins wavy: fls. 2–3 from each spathe, 4 in. across, with a white tube. Islands of the Levant and Asia Minor. B. M. 1028.

C. Párkinsoni, Hook. f. (B. M. 6090), is the best of all the tessellated forms, the tessellation being more sharply defined and more delicate than the type. It is a smaller plant, and has shorter and more strongly undulated lvs., which lie closer to the ground. Of this plant Parkinson said in his Paradisus Terrestris, 1629: "This most beautiful saffron flower riseth up with his flowers in the Autumn, as the others before specified do, although not of so large a size, yet far more pleasant and delightful in the thick, deep blew or purple-colored beautiful spots therein, which make it excel all others whatsoever. The leaves rise up in the Spring, being smaller than the former, for the most part 3 in number, and of a paler or fresher green colour, lying close upon the ground, broad at the bottom, a little pointed at the end, and twining and folding themselves in and out at the edges as if they were indented. I have not seen any seed it hath borne. The root is like unto the others of this kinde, but small and long, and not so great; it flowreth later for the most part than any of the other, even not until November, and is very hard to be preserved with us, in that for the most part the root waxeth lesse and lesse every year, our oold country being so contrary unto his natural that it will scarce shew his flower; yet when it flowereth anything earlie, that it may have any comfort of a warm Sun, it is the glory of all these kindes."

DD. *Lvs. ascending.*

E. *Margin of lvs. wavy.*

5. **Aggrìpìnum**, Baker (*C. tessellàtum*, Hort.). Corms a trifle thicker than in No. 4: lvs. 3–4, 6–9 in. long, 12–15 lines wide, margin wavy: fls. 2–4 from each spathe. F.S. 11:1153.—This is a marked form of *C. variegatum*, of garden origin, which has similar fls., but a more robust habit and more nearly erect lvs.

EE. *Margin of lvs. flat, not wavy.*

6. **Bivònæ**, Guss. Lvs. 6–9, nearly 1 ft. long, 9–15 lines wide, rather hooded at the apex, margin flat, not wavy: fls. 1–6 from each spathe. Sicily.

CC. *Tessellation less distinct.*

7. **Síbthorpi**, Baker. Easily distinguished from Nos. 4, 5, and 6 by the much broader segments of the perianth, and by the lvs., which are nearly erect, obtuse, and not at all wavy: lvs. 5–6, dull green finally 1 ft. or more long, 1½–2½ wide, narrowed gradually to the base: spathe striped with green, and tinged with lilac at the tip: fls. 1–5 from each spathe; perianth tube often 6 in. long. Mts. of Greece. B. M. 7181.—A large, cup-shaped flower, showing no open spaces between the broad, overlapping segments. Very handsome.

BB. *Perianth not tessellated.*

C. *Size of fls. large, 3 in. or more across.*

D. *Lvs. broad, 3–4 in. wide.*

E. *No. of fls. 1–4.*

8. **speciòsum,** Steven. Corm 2 in. thick, the largest of the genus: stem 1 ft. high: lvs. 4–5, 12–15 in. long, 3–4 in. wide, narrowed from the middle to the base, shining green: fls. 1–4 from each spathe, violet, with a white eye, but varying almost to pure pink, often 6 in. across. Caucasus. B. M. 6078. F. S. 23: 2385. F. M. 1876: 235. Gn. 11: 80.—Generally considered the finest species of the genus.

EE. *No. of fls. 12–20.*

9. **Byzantìnum,** Ker-Gawl. Closely allied to the above, but with wider lvs., smaller and paler fls., and broad, short anthers: stem 6 in. high: lvs. 5–6, oblong, dark green, striate, 9–12 in. long, 3–4 in. wide: fls. smaller than in No. 8, usually 3–4 in. across, lilac-purple, and often 12–20 from each spathe. Transylvania and Constantinople. B. M. 1122. *C. Cilìcicum,* Hort., has rosy fls., somewhat tessellated. G.C. III. 23: 35.

DD. *Lvs. narrow, 1–2 in. wide.*

10. **autumnàle,** Linn. Fig. 516. Stem 3–4 in. high: lvs. 3–4, rarely 5–6, 9–12 in. long, 1½–2 in. wide: fls. 1–4, rarely 5–6, from each spathe, purple, with a white variety, about 4 in. across: perianth veined. Europe and N. Africa. B.M. 2673, as *C. crociflorum.*—Possibly the commonest in the American trade. It has beautiful double forms in purple and pure white. F.S. 19: 1936.

516. Colchicum autumnale (× ⅓).

CC. *Size of fls. small, about 2 in. across.*

D. *No. of fls. from each spathe more than 1 or 2.*

E. *Perianth segments acute.*

11. **Troòdi,** Kotschy. Corm medium-sized: lvs. 3–4, 6–12 in. long, 9–12 lines wide, dark green above: fls. 4–5 or even 12, lilac-purple, about 2 in. across; perianth segments lanceolate-acute. Cyprus. B.M. 6901 shows a pure white variety.

EE. *Perianth segments obtuse.*

12. **umbròsum,** Steven. Corm small: lvs. 4–5, 6–9 in. long, 9–12 lines wide: fls. 1–5 from each spathe, lilac, about 2 in. across; perianth segments oblanceolate, obtuse, with 8–12 veins. Caucasus.

DD. *No. of fls. from each spathe 1 or 2.*

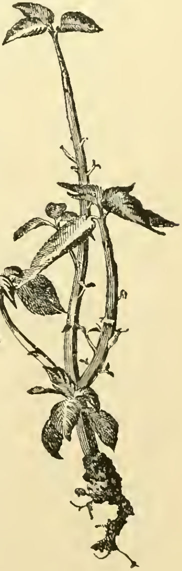
13. **alpìnum,** DC. Lvs. 2, rarely 3, nearly erect or spreading, 4–8 in. long, 3–6 lines wide, obtuse, channeled, shining green, narrowed from the middle to the base: fls. 1 or 2 from each spathe, about 2 in. across, lilac; segments oblanceolate, obtuse, 3–4 lines wide, with 10–15 veins. Mts. of France and Switzerland. W. M.

CÒLEUS (Greek for *sheath,* referring to the monadelphous stamens). *Labiàtæ.* Nearly 50 species in Trop. Afr. and Asia, some of which are cult. for the very showy colored foliage. The cultivated kinds are herbs, but some of the wild species are shrubs. Lvs. opposite, dentate or serrate: stem 4-angled: fls. in a terminal spike-like raceme, small and usually bluish, the 5-toothed calyx deflexed in fr.; corolla bilabiate, the lower lobes longer and concave, and inclosing the essential organs.

517. Coleus cutting.

Coleuses are of most easy culture. They root readily from short cuttings, cut either to a joint or in the middle of an internode (Fig. 517). No plant is more easy to root than this. They may be rooted at any time of the year when new wood is to be obtained. Formerly Coleuses were much used for bedding, but the introduction of better plants for this purpose has lessened their popularity. They require a long season; they are apt to burn in the hot summers of the interior country; they have a weedy habit. However, they withstand shearing and are, therefore, useful for carpet-bedding. The leading variety for this purpose is still the old Golden Bedder, whose golden yellow foliage is used as filling for fancy designs. Coleus plants make excellent specimens for the window-garden and conservatory. Best results are obtained when new plants are started from cuttings each spring. The old plants become leggy, lose their lvs., and lack brightness of color. They are very subject to mealy-bug. They are also liable to root-gall (the work of a nematode worm), as shown in Fig. 518. When plants are thus affected, take cuttings and burn the old plants, and either bake or freeze the soil in which they grew.

The garden varieties of Coleus are legion. These are the issue of **C. Blùmei,** Benth., of Java (B.M. 4754. I.H. 27: 377; 35: 46; 39: 164. F. S. 22: 2287–8). This is a soft perennial herb growing 2–3 ft. high, little branched: lvs. ovate, narrowed or broad at base and long-acuminate, sharply and nearly regularly toothed, variously colored with yellow, dull red and purplish. An extreme form of this is var. **Verschaffèltii,** Lem. (*C. Verschaffeltii,* Lem.), Fig. 519, which is more robust and branchy, the lvs. more brilliantly colored, acute but not acuminate, truncate or even cordate at base, and irregularly cut-dentate, with rounded teeth, giving the margin a crispy effect (I. H. 8: 293). In some forms, the lvs. are laciniate.



518. A Coleus attacked by root-galls.

C. thyrsoìdeus, Hook., is a recent novelty, but is not yet in the Amer. trade. Unlike the other well known species, its foliage is not brilliantly colored and its flowers are conspicuous. Tender shrub, 2–3 ft. high: stems pubescent: lvs. cordate, coarsely crenate, lower ones 7 in. long: fls. blue, in racemes which contain as many as 18 forking cymes with about 10 fls. in each. B.M.7672.

L. H. B.

519. Coleus Blumei, var. Verschaffeltii.

COLIC-ROOT. *Aletris farinosa.*

COLLARDS. A kind of kale. In the south, a form of the plant known as Georgia Collards is much grown for domestic use and the southern market. The plant grows to 2–3 ft. high and forms no head, but the central lvs. often form a kind of loose rosette. These tender lvs. are eaten as a pot-herb, as all other kales are. Fig. 295, page 199, shows a Georgia Collard, although the rosette is not well marked. The seeds may be started in a frame under glass, or in a seed-bed in the open. As far south as the orange-belt, they are usually started in February and March, in order that the plants may mature before the dry, hot weather. Farther north they are started in July or August, and the plants are ready for use before cold weather. Transplant to rows 3½–4 ft. apart, and 3 ft. apart in the row. Till as for cabbage.

Young cabbage plants are sometimes eaten as "greens" under the name of Collards; and cabbage seeds are sown for this specific purpose. In the north, where heading cabbages can be raised, Collards of whatever kind are not greatly prized. L. H. B.

COLLINSIA (after Zaccheus Collins, American philanthropist and promoter of science, Philadelphia, 1764–1831). *Scrophulariàceæ.* About 18 species of hardy annuals from California and western North America, not far removed botanically from Pentstemon and Chelone. They are free-flowering and of the easiest culture. They may be sown outdoors in the fall in well-drained soil, and will bloom earlier than if sown in spring. Their fls., borne in midsummer, range in color from white through lilac and rose to violet, with clear, bright blue also, at least on one lip of the fl. There is no yellow. All those described below have fls. in whorls. Lvs. opposite, rarely in whorls of 3, entire, or toothed, the lower lvs. rarely 3-cut.

A. *Fl.-stalks very short, giving the clusters a dense appearance.*

B. *Corolla strongly declined: throat as wide as long.*

bícolor, Benth. Fig. 520. Height 1 ft., hairy, glabrous, or sticky: stems weak and bending: lvs. more or less toothed, and oblong or lanceolate, sessile, opposite or in 3's: fls. typically purple and white, with 5 or 6 well marked color varieties. Var. **álba,** Hort. (Fig. 521), has pure white fls., or the lower lip greenish or yellowish. Var. **multicolor,** Voss. (*C. multicolor,* Lindl. & Paxt.), has variegated fls., the same fl. being white, lilac, rose or violet on either lip or both. Var. **multicolor marmoràta,** Hort., has the lower lip white, suffused lilac, and upper lip light lilac, spotted and striped carmine. Calif. B.M. 3488. P.M. 3:195.—This is the most widely distributed and variable species, and the one on which the genus was founded. California, mostly in moist ground.

BB. *Corolla less strongly declined; throat much longer than broad.*

bartsiæfòlia, Benth. Height 1½ ft.: sticky and somewhat glandular, rarely hairy: lvs. from ovate-oblong to linear: fls. purplish or whitish: seeds not wrinkled. Calif.

AA. *Fl.-stalks ½ in. long or more, giving the clusters a looser look.*

vérna, Nutt. Height about 6 in.: lvs. ovate or oblong, or the lowest rounded and slender-stalked, and the upper ovate-lanceolate and partly clasping: whorls about 6-fld.: fl.-stalks longer than the fls.: throat of the corolla as long as the calyx lobes; lower lip bright blue; upper lip white or purplish: seeds thick, not flattened, oblong, arched. Moist woods, western New York and Penna. to Wis. and Ky. B.M. 4927.

grandiflòra, Dougl. Height 4–12 in.: lvs. thickish, the lowest roundish and stalked; whorls 3–9-fld.: fl.-stalks about as long as the fls.: lower lip deep blue or violet; upper lip white or purple: throat of the corolla sac-like, as broad as long, or as long as the upper lip: seeds roundish, smooth. Shady hills of Calif. W. M.

COLLINSÒNIA (after Peter Collinson, the friend of Linnæus and John Bartram, a most interesting man). *Labiàtæ.* HORSE-BALM. HORSE-WEED. STONE-ROOT. A genus of 4 species confined to Atlantic N. Amer. Hardy perennial herbs with large, odorous, ovate, serrate, mostly long-stalked lvs., thick roots, and simple or panicled, naked, terminal racemes of yellow or whitish fls. The following is of the easiest culture and may be obtained from dealers in native plants:

Canadénsis, Linn. Height 2–4 ft.: lvs. 4–9 in. long, broadly ovate to oblong: racemes panicled: calyx in fl. 1 line, in fr. 4 or 5 lines long: corolla lemon-yellow, lemon-scented, ½ in. long. Rich woods, Canada to Wis., and south to Florida.

520. Collinsia bicolor.

521. Collinsia bicolor, var. alba (× ½).

COLLÒMIA. This genus is included by Gray in Gilia, which see. Collomia is derived from *kolla,* glue, from the large quantity of mucus in the outer covering of the seed. When these seeds are placed in water, the mucous matter dissolves and forms a cloud about them. This cloud, according to Lindley, "depends upon the presence of an infinite multitude of exceedingly delicate and minute spiral vessels lying coiled up, spire within spire, on the outside of the testa, and the instant water is applied they dart forward at right angles with the testa, each carrying with it a sheath of mucus, in which it for a long time remains enveloped in a membranous case."

COLOCÀSIA (old Greek substantive name). *Aròideæ.* Perennial herbs with cordate-peltate lvs., which are often handsomely colored in cultivation. Differs from Alocasia and Caladium in floral characters: spadix terminating in a club-shaped or subulate appendage destitute of stamens. Species 5. Tropics. Monogr. by Engler, DC. Phaner. Monogr. 2: 490.

Colocasia includes the plants known as *Caladium esculentum*, which are much grown for subtropical bedding. *C. odorata* (which is an Alocasia) has very large, thick stems, which may be wintered over safely without lvs., or at most with 1 or 2, the stems, to save space, being placed close together in boxes. *C. esculenta* rests during the winter and is kept under a greenhouse bench or anywhere out of the reach of frost or damp. Rich, damp ground suits both kinds. Of easy culture. Consult *Caladium* for treatment.

Colocasias furnish the much-cultivated Taro of the Pacific tropics, this edible product being the large, starchy roots. From it is made the Poi of Hawaii. In Japan and other countries the tubers of Colocasias are much cultivated, and are handled and eaten much as we use potatoes (see Georgeson, A.G. 1892:81). The young lvs. of some kinds are boiled and eaten.

antiquòrum, Schott. Lvs. peltate-ovate: basal lobes half as long as the apical one, connate ⅔–¾ their length, separated by a broad, triangular, obtusish sinus. India. B.M. 7364.

Var. **euchlòra**, Schott (*C. euchlòra*, C. Koch). Petioles violet; blade black-green, with violet margins.

Var. **Fôntanesii**, Schott (*Alocàsia violàcea*, Hort. *Calàdium violàceum*, Hort. *C. albo-violàceum*, Hort.?). Petioles violet; blade dull green, with violet margins.

Var. **illústris**, Engl. (*C. illústris*, Hort.). Petioles violet; blade more oblong-ovate, with black-green spots between the primary veins.

Var. **esculénta**, Schott (*Calàdium esculéntum*, Vent. *Colocàsia esculénta*, Schott). ELEPHANT'S EAR. Fig. 522. Spadix with an appendage half as long as the staminate inflorescence; lvs. bright green, often 3 ft. or more long, nearly as wide. Hawaii and Fiji.

affìnis, Schott. Blade thin, membranaceous, rounded-ovate or ovate, the apical lobe scarcely ¼ or ⅓ longer than wide; basal lobes connate nearly their entire length, bright green above, glaucous beneath; blade only 4–6 in. long. Himalaya.

Var. **Jénningsii**, Engl. (*Alocàsia Jénningsii*, Veitch). Petiole purplish, with transverse purple lines; blade cordate, emarginate, with large, oblong or triangular black-green or black-violet spots between the primary lateral veins. I.H. 16: 585. F.S. 17:1818–19.

Nèo-Guinénsis, Lind. Remarkable for its tufted habit, the shortness of the leaf-stalks, its short-stalked inflorescence, and the beautiful green tone of its smooth and shiny lvs., spotted with creamy white. New Guinea. I.H. 27:380.

Márchalli, Engler (*Alocàsia Márchalli*, Hort. *A. hŷbrida*, Bull). Hybrid, probably of *C. affinis* and *C. antiquorum*. Larger in all parts than *C. affinis*, the petioles pale green, very slightly emarginate, with large, confluent spots.

C. Bataviènsis = Alocasia Bataviensis? — *C. Caracasàna*, Engler = Xanthosoma. — *C. Javànica*, Hort. = ? — *C. Mafáffa*, Hort. = Xanthosoma. — *C. marginàta*, Hort. = Caladium bicolor. — *C. odòra*, Brongn. = Alocasia odora, Koch. Tree-like, the stem or caudex 3–6 ft. and 6 in. in diam.; lvs. green, cordate, stalked, bearing peduncles in pairs in their axils. E. Asia. B.M. 3935. — *C. odoràta*, Hort. = Alocasia macrorrhiza.

JARED G. SMITH and G. W. OLIVER.

COLOCYNTH. See *Citrullus*.

COLOR. The range of simple colors common among flowers is not a very extensive one. It comprises yellow, gold-yellow, orange, scarlet, red, crimson, magenta, purple, violet, and ultramarine blue. The variation of these hues is, however, manifold. Diluted with white, or mixed with one another, colors assume an infinite number of phases not easily described (Fig. 523). But the generic character of flower colors is certainly comprehended in the few names given above. Color-names are of little consequence so long as the color is identified. Unfortunately, scientists and artists have not yet established a standard nomenclature of color, so that the name of a particular hue is largely determined by popular opinion, and that, of course, is not always unanimous.

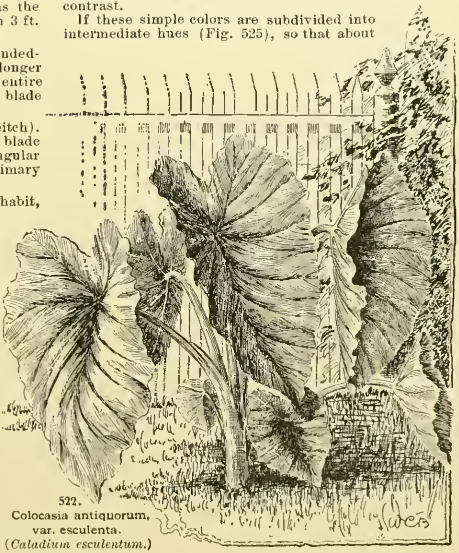
It is, therefore, necessary to accept both popular and scientific estimates of color if colors are to be considered in relation to flowers. The scientific definition of a color like scarlet, magenta, or violet amounts to its identification with certain lines in the spectrum. Such definitions are properly given in the Century Dictionary. They are satisfactory so far as they go, but the relation of colors in the spectrum to flower petals or artists' pigments is not so satisfactorily determined. Apparently the standard of the spectrum must be supplemented by another of a more tangible nature—that is, a standard of pigment color. But it is just as well to substitute a flower petal for a pigment, and if this is done, the result would be about this:

Yellow.—Evening primrose.
Gold-yellow.—Pure gold calendula or deep yellow calendula.
Orange.—Deep-hued eschscholtzia and orange nasturtium.
Scarlet.—Mme. Crozy canna.
Red.—Portia carnation.
Crimson.—Deep-hued sweet-william and pæony.
Magenta.—Deep purplish red cineraria.
Purple.—Deep-toned larkspur, aster, and cineraria.
Violet.—Deep-toned English violets.
Ultramarine blue.—New compact blue delphinium.

Pure green is best represented by the artists' pigment called emerald-green; it is rarely present in foliage, except perhaps in spring.

If the simple colors, yellow, orange, red, purple, blue, and green, are arranged in a circle (Fig. 524), the colors opposite each other harmonize by reason of absolute contrast.

If these simple colors are subdivided into intermediate hues (Fig. 525), so that about



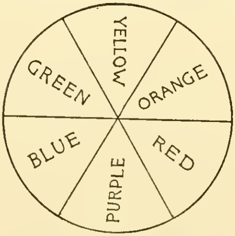
522. Colocasia antiquorum, var. esculenta. (*Caladium esculentum.*)

three of the latter lie between the six original colors, the result will be a circle of twenty-four divisions, having the effect of a rainbow. This will perfectly illustrate the principle of color harmony and color discord. Besides the opposing colors which harmonize by contrast, there are neighboring colors which harmonize by analogy or harmony. For instance, any four or five colors lying side by side in the circle are bound together harmoniously by reason of their near relationship. Therefore, all these four or five colors may be combined—and nature does combine them—with æsthetic results. But skip over four of the colors and attempt a combination of the first and sixth, and the result will prove a discord, the bond of relationship is broken, and the eye is disturbed by the aggressiveness of two colors between which there is evidently no bond of sympathy. It would be safe to say, therefore, that the circle demonstrates the fact that its colors situated at right angles with each other are discordant, and those lying nearly parallel with each other are harmonious.

WITH BLACK	WITH WHITE	CLEAR COLOR
OLD GOLD	SULPHUR	YELLOW
OCHRE	STRAW Y.	COLD Y.
BURNT ORANGE	SALMON	ORANGE
TERRA COTTA	SHRIMP P.	SCARLET
CARDINAL	PINK	RED
MAROON	C. PINK	CRIMSON
PLUM	P. LILAC	MAGENTA
DARK B. PLUM	LILAC	PURPLE
LOGWOOD VIOLET	B. LILAC	VIOLET
INDIGO	V. BLUE	ULTRAMĒ

523. Color phases in flowers.

This is the theoretical side of color harmony. The practical side is scarcely different; it simply modifies the theory. Brilliant blue and orange, which are theoretically harmonious, are scarcely as agreeable in each other's company as the rule would imply. The trouble, however, lies with the brilliancy. The golden calendula and the deep blue-purple aster in association are rather violent and aggressive. Remove the one or the other and substitute a pale-tinted flower of either hue, and the result will be a harmonious one.



524. Harmony by contrast.

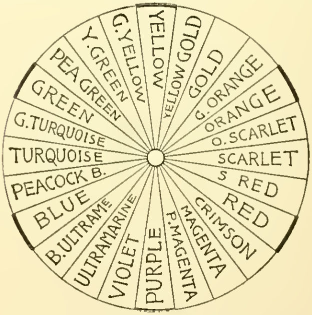
Flower families are very apt to sustain harmonies of analogy; hyacinths, sweet peas, and nasturtiums represent families with most extraordinarily near-related colors. There is a predominating force of crimson in the sweet pea, and a predominating force of orange in the nasturtium. It is rather a nice bit of color adjustment in either family to choose flowers which excel in harmony of color the careless grouping together of flowers picked at random.

But the theory that analogous colors harmonize is correct only if it is not carried to excess. Attempts to force deep-hued flowers into harmony often lead to contrary results. A range of color from crimson to ultramarine depends for its harmony upon the simplicity or the delicacy of the hues. Such colors, in full force, would do violence to each other. It is tempting the hardness of a diamond to pound it with a sledge hammer. It is taxing crimson too heavily to expect it to show its strength in the presence of strong violet! If the effort is to merge the personality of the crimson flower into the purple one, and effect a play of color between the two, the combination of strong hues thus is justifiable.

The theory that colors at right angles on the wheel are discordant is also subject to some modification. Relatively the right-angled colors must be crude and strong to objectionably affect the eye. Yellow and red in the rose is an agreeable color combination. Yellow and red dahlias crowded together are abominably harsh under a sensitive eye.

A country bouquet of asters, marigolds, fuchsias and dahlias is bad, because the country garden is not a part of it. A few feet of air and space and a stretch of green foliage make a world of difference.

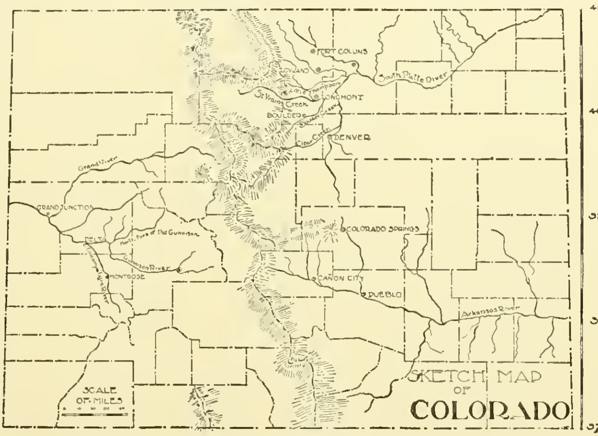
It is wisest to try the effect of one color upon another before allowing two or three strong hues to wage war with each other. It will be quickly found that white is a peacemaker, and green is an invaluable mediator. With these colors at command, the chances of color discord are reduced to a minimum. Everything also depends upon simplicity in color combinations. It is questionable whether a combination of more than two colors can ever be æsthetically a success. The adjustment of many colors needs the hand of an expert. F. Schuyler Mathews.



525. The intermediate hues.

COLORADO, HORTICULTURE IN. The state of Colorado includes the territory lying between the parallels 37° and 41° north latitude, and between the meridians 102° and 109° west longitude. Its surface is diversified by mountains, high table lands, plains and valleys, with a range above tide-water of from 3,400 feet on the eastern border to over 14,000 feet in many snow-clad peaks. It is traversed from north to south by the great Rocky mountain range, and thus divided into two well marked though unequal divisions. The main "continental divide" is supplemented by several well-defined ranges, and by numerous mountain spurs, between which, and at altitudes ranging from 7,000 to 10,000 feet, lie the four large and several smaller parks or valleys, which are in great part utilized as hay ranches and for stock ranges. The following figures regarding acreage are from the report of the state engineer for the year 1890. The total is given as approximately 66,560,000 acres. East of the continental divide lie 40,800,000 acres, and on the west 25,760,000 acres. Of the area east of the divide, one-third, or 10,200,000 acres, lies within the mountains and the remainder, 30,600,000 acres, consists of plain and valley lands. On the western slope the proportion of mountain and plain is reversed, there being 16,360,000 acres within the mountains and about 9,400,000 acres of plain and valley lands.

For the western slope the rainfall is given as 33 inches for the mountains and 10.7 for the plains and valleys, and for the eastern slope as 30 inches for the mountains and 15 inches for the plains. The tillable lands of the state are in the main outside the mountains, and the average annual rainfall on these lands is near 13 inches for the whole state. This rainfall comes mainly in the months of April, May and June, the precipitation for the other months being usually very small. It follows, from the small rainfall, that crops can only be successfully grown by irrigation, and it is this idea that has dominated the agriculture and horticulture of the state ever since the beginning, nearly forty years ago.



526. To show horticultural regions of Colorado.

Irrigation being a necessity, the lands useful for agricultural purposes would be those reasonably level tracts bordering the streams, and extending back only as far as the water can be carried. The first ditches were constructed cheaply, and for the irrigation of first bottom lands only. A little later the idea of utilizing the higher mesas gave rise to canal systems of great magnitude, that have made productive vast tracts of fertile soil. The period of canal construction east of the continental divide has about ended, there being now as many ditches as the streams can supply, or possibly more. On the western slope, where the water supply is greater, additional systems may yet be constructed. The present most pressing problem on the eastern slope is the conservation of the available water. Attention is being given to the construction of reservoirs, and this, coupled with that economy in the use of water which experience is gradually teaching, will go far toward solving the problem, and it may yet be possible to considerably extend the area now irrigated. Owing to differences in latitude, altitude, and climatic conditions, the irrigable regions of the state are naturally separable into three divisions, and in considering the horticultural features, it is best to recognize these divisions because they differ in the range of horticultural productions. The divisions are:

1. The Northern, which embraces the drainage basin of the South Platte and its tributaries, Clear creek, Boulder creek, St. Vrain, Little Thompson, and Cache la Poudre.

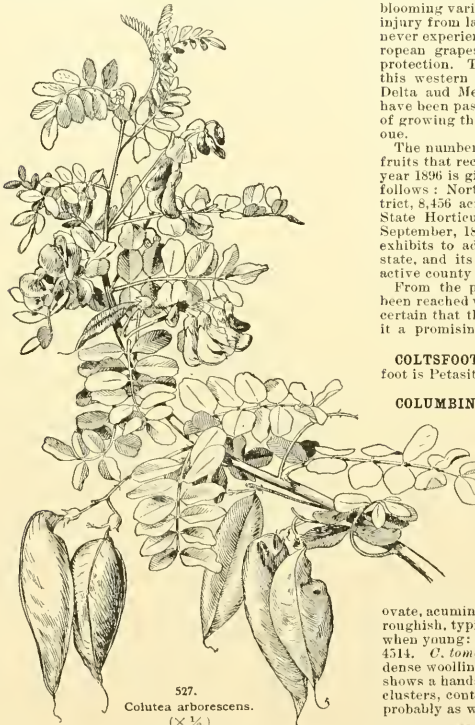
2. The Southern, embracing the valley of the Arkansas and its tributaries.

3. The Western, embracing all the cultivated valleys of the western slope lying along the Uncompahgre, Gunnison, and Grand rivers and their branches, and being mainly in the counties of Montrose, Delta and Mesa.

THE NORTHERN DISTRICT.—From such statistical information as is at hand, it appears that the commencement of fruit planting in Colorado dates from 1863. In that year William Lee, who owned a ranch on the bottom lands along Clear creek, between Denver and Golden, planted a number of apple trees which he hauled in a wagon from Iowa City, Ia. In the fall of the same year, Messrs. Perrin and Wolff, of Denver, hauled a load of trees from Des Moines, Ia., and such as survived the journey were planted on ranches about Denver. In 1866, a representative of a Kansas nursery sold trees and plants to many of the farmers along the St. Vrain, and about the same time a few trees were planted on the ranches along the Thompson. These early attempts to start fruit culture in the northern district were practically failures, for very few of the trees lived. The long journey from the nursery to the farm, improper preparation of the ground, lack of care in the application of water, and in protecting from stock, and the sentiment commonly expressed by the majority of the inhabitants, that fruit could not be grown in Colorado, were obstacles hard to overcome. A few of the early settlers, however, having hope of ultimate success, made a second attempt in 1870, and from the plantings of that year have grown the many fine orchards that dot the northern valleys. In the most northern valley, that of the Cache la Poudre, planting did not commence until about 1873, and except with small fruits, very little was done in the 10 or 12 years following, or until the success of the pioneers in planting demonstrated that the hardier fruits could be grown. During the past 5 years the area in fruit has increased rapidly, until now the farm without its orchard is the exception. The apple is here, as in the other fruit districts, the principal fruit, covering the greatest number of acres and receiving more attention than all other fruits. All standard varieties are grown, and the product meets a ready sale. Plums are successfully grown, and prove profitable, but the range of varieties is restricted to those derived from *Prunus Americana* and a few of the hardier varieties of *Prunus domestica*. Cherries of the Morello class are very productive, and the demand for the fruit is encouraging growers to plant freely. Throughout the district much attention is given to the growing of small fruits and vegetables. All kinds of berries find a ready market in the cities and mountain towns, and the staple vegetables, such as onions, cabbages and celery, are shipped in large quantities to southern points.

THE SOUTHERN DISTRICT.—Here the counties most prominent in fruit culture are Fremont, Pueblo and Otero. The first planting was done in Fremont county, and the following concerning the circumstances I quote from an address by Judge W. B. Felton before the State Horticultural Society, as published in the report for 1887–8: "The first fruit trees were set out in Fremont county in 1867. W. C. Catlin went to Pueblo for an invoice of trees which had been ordered by himself and by Governor Anson Rudd, W. A. Helm and Jesse Frazier. They had been brought across the plains in a wagon to Pueblo, and Mr. Catlin brought them to Canon, something over $500 worth of trees occupying a small space in his wagon. A few of these trees, and only a few, are still living. After his first attempt, which was almost a total failure, Jesse Frazier procured several thousand root grafts and set them out in nursery rows. When they became large enough he transplanted them into his orchard." By the year 1879, Mr. Frazier had an orchard of 15 acres, the older portion of which produced 3,000 bushels of apples. Since 1880, the yearly additions to the orchard area of this county have steadily increased, and fruit-growing is now recognized as one of the leading industries of the county. As in the other districts, the apple receives the most attention, but pears, plums, and the small fruits are grown in quantity. Peaches have been raised, but are not a sure crop, owing to the liability to late spring frosts.

Farther down the Arkansas valley, in Otero county, the first fruit trees were planted about 1882, but general interest in orchard planting did not develop until some years later. During the past 5 years the area planted has rapidly increased, and the county now stands about fourth in orchard acreage. The growing of melons has within a few years brought this county into prominence. Started in a small way by farmers near the town of Rocky Ford, the business has spread into a great industry, and Rocky Ford melons and cantaloupes have found their way into all the large markets of the country.


527. Colutea arborescens. (× ½.)

THE WESTERN DISTRICT.—The valleys constituting this were included in the Ute Reservation, which was first opened for white settlement in the fall of 1881. The first fruit trees were planted the next spring by Messrs. Hotchkiss and Wade, on their ranches lying along the North Fork of the Gunnison in Delta county. In the spring of 1883 W. S. Coburn began planting what is now one of the finest orchards in the state; others followed, and soon the fame of the "North Fork" as a fruit region went abroad and served as a stimulus to planting in other sections. It was not, however, until 1886 that planting became general. In that year orchard planting about Grand Junction, in Mesa county, began in earnest, and at the same time the farmers of Montrose turned their attention in the same direction. The development of the industry from 1886 down to the present time has been phenomenal. There appears to be no limit to the successful culture of all temperate region fruits. On the low bottom lands along the streams, the earlier blooming varieties have occasionally been subjected to injury from late frosts, but on the mesas this trouble is never experienced, and here the tender varieties of European grapes are successfully grown without winter protection. The "peach belt" of the state lies within this western district in the three counties—Montrose, Delta and Mesa. The experimental stages of culture have been passed, success is assured, and the business of growing this fruit is in a fair way to become a large one.

The number of acres planted with orchard and small fruits that received water from the ditches during the year 1896 is given in the report of the state engineer as follows: Northern district, 15,025 acres; Southern district, 8,456 acres; Western district, 22,162 acres. The State Horticultural Society, which was organized in September, 1880, has done much by its meetings and exhibits to advance the horticultural interests of the state, and its work has been supplemented by several active county societies.

From the present state of advancement, which has been reached within a comparatively short time, it seems certain that the fruit industry of the state has before it a promising future. C. S. CRANDALL.

COLTSFOOT. See *Tussilago Farfara*. Sweet Coltsfoot is Petasites, formerly called Nardosma.

COLUMBINE. See *Aquilegia*.

COLQUHOÙNIA (after Sir Robert Colquhoun). *Labiàtæ*. Tender plants with dense whorls of gaping fls. an inch long or more, colored scarlet and yellow. The genus has 5 species, all from the Himalayas and Burma. Erect or twining shrubs, woolly in all parts when young: lvs. large, crenate: whorls few-fld., axillary or crowded into a terminal spike.

coccínea, Wall. Tall climber, with very long branches: lvs. stalked, ovate, acuminate, 3–5 in. long, crenate, dark green above, roughish, typically with scarcely any woolliness except when young: corolla twice as long as the calyx. B. M. 4514. *C. tomentòsa*, Houll., is probably identical. The dense woolliness is probably temporary. R.H. 1873:130 shows a handsome terminal spike in addition to axillary clusters, containing about 20 fls.—Not advertised, but probably as worthy as the next.

vestìta, Wall. Very similar to *C. coccinea*, except that it is a low-growing, erect plant, and more densely and permanently woolly on the stem, calyx and under side of lvs. Cult. outdoors at Santa Barbara, Calif., but not promising. W. M.

COLUMN. A solid central body formed of stamens and styles grown together, as in orchids.

COLUMNEA (after Columna or Colonna, Italian writer on plants, sixteenth century). *Gesneràceæ.* Tropical American shrubs and climbers, with widely gaping, showy fls. often 2 in. long: lvs. opposite, nearly equal or widely unlike: fls. solitary or numerous, axillary, stalked or not, without bracts or with bracts in an involucre; corollas scarlet, carmine or yellowish. Half a dozen species, mostly red or orange-fld., are cult. abroad and may be known to a few fanciers at home, but none are advertised by the dealers.

COLÙTEA (*Koloutea*, ancient Greek name). *Leguminòsæ.* BLADDER SENNA. Deciduous shrubs, with alternate, odd-pinnate lvs.; lfts. many, rather small: fls. papilionaceous, in axillary, few-fld., long-peduncled racemes, yellow to brownish red: pod inflated, bladder-like, many-seeded. About 8 species in the Mediterranean region to Himal. Ornamental free-flowering shrubs of rapid growth, with pale green or glaucous foliage and yellow or brownish red fls. during summer, followed by large, usually reddish-coloring and decorative pods. They grow in almost any soil, but prefer a tolerably dry and sunny position; not quite hardy north. Prop. by seeds sown in spring or by cuttings of mature wood inserted in fall in sandy soil; rarer species and varieties are sometimes grafted on *C. arborescens* in spring under glass.

A. *Fls. yellow: pod closed at the apex.*

arboréscens, Linn. Fig. 527. Shrub, to 15 ft.: lfts. 9–13, elliptic, dull green, mucronulate, usually slightly pubescent beneath, ½–1 in. long: fls. 3–8, about ¾ in. long; wings nearly as long as the keel, flat. June–Sept. S. Eu., N. Afr., N. B.M. 81.—Var. **crispa**, Hort. Dwarf, with crisped lvs.

AA. *Fls. orange-yellow or brownish red; wings shorter than the keel.*

mèdia, Willd. Shrub, to 10 ft.: lfts. 7–13, obovate, grayish green or glaucous, ⅓–⅔ in. long, nearly glabrous: fls. 3–6, orange or reddish yellow: pod closed at the apex. June–Sept. Probably hybrid of garden origin between the former and the following, often cult. under the names of the following species:

orientàlis, Mill. (*C. cruénta*, Ait.). Shrub, to 6 ft.: lfts. 7–11, obovate, glaucous, thickish, ⅓–½ in. long, nearly glabrous: fls. 3–5, reddish yellow or brownish red: pod open at the apex. June–Sept. S. E. Eu., Orient.—Often cult. under the name of *C. Halepica* or *C. Istria.*

C. Halépica, Lam. (C. Istria, Mill.). To 4 ft.: lfts. glaucous, small and numerous: fls. yellow, nearly 1 in. long; wing longer than the keel.—*C. longialàta*, Koehne (C. melanocalyx, Hort., not Boiss.). Similar to C. arborescens: wings longer than the keel. G.C. III. 16:155 as C. melanocalyx.—*C. Nepalénsis*, Hook. Similar to C. arborescens: racemes drooping. B.M. 2622. B.R. 20:1727. Tender.

ALFRED REHDER.

COLVÍLLEA (after Sir Charles Colville, governor of Mauritius). *Leguminòsæ.* The gorgeous fls. of this tropical tree are a worthy rival of the Royal Poinciana, which is closely allied, but easily distinguished. It has drooping racemes 1½ ft. long, densely crowded with perhaps 200 fls. of curious shape and of a splendid scarlet. The fls. open at the stem-end of the pendent dense raceme, and display masses of long, showy, yellow stamens. The unopened fls. are about the size and shape of a filbert, and these are gradually smaller towards the end of the raceme. The genus has only this one species, and is characterized by its large, oblique, colored calyx, having 4 segments, the standard being the smallest instead of the largest part; the wings very long, narrow, erect, obovate, the pod 2-valved. Supposed to be a native of E. Afr., but discovered in 1824 by Bojer on the west coast of Madagascar, where a single tree was cult. by the natives. It flowered there in April or May. Its culture is similar to that of Cæsalpinia. Prop. in the south only by seeds.

racemòsa, Boj. Tree, 40–50 ft. high, with the general aspect of *Poinciana regia* but with a thicker trunk and ampler foliage: branches very long and spreading: lvs. about 3 ft. long, alternate, remote, twice pinnate, with 20–30 pairs of pinnæ which are opposite, 4 in. long, and have 20–28 pairs of lfts., each ½ in. long: keel very small, almost covered by the wings: free stamens 10, 3 inserted below the standard, 2 under the wings, 1 under the keel, and 4 under the ovary. B.M. 3325–6.

W. M.

COMAROSTÀPHYLIS is included with *Arctostaphylos.*

COMÀRUM (an old Greek name). *Rosàceæ.* One species allied to Potentilla, and often referred to that genus. **C. palùstre**, Linn., the Marsh Cinquefoil, is a decumbent herb growing in swales in the N. states (also in the Old World), with pinnate, 3–7-foliolate lvs. (lfts. dentate), and solitary or cymose purple fls. 1 in. across: petals shorter than the calyx lobes, acute; stamens numerous. An odd and interesting but not showy plant, sometimes planted in bogs. Mn. 3:97.—The fr. somewhat resembles a strawberry, but is spongy instead of juicy. In some parts of Scotland, it is said, they are called Cowberries, and are rubbed on the inside of milk pails to thicken the milk.

COMBRÈTUM (old Latin name). *Combretàceæ.* Many tropical shrubs and trees in Asia, Africa and America, particularly in S. Africa. Many of them are climbers, by means of the persistent leaf-stalks. Lvs. mostly opposite, entire: fls. in spikes, polygamous; calyx bell-shaped; petals usually 4; stamens usually 8: fr. winged and indehiscent, 1-seeded. The Combretums are warmhouse plants, little known in this country. Prop. by cuttings of firm wood. One climbing species is in the Amer. trade: **C. coccineum**, Lam. (*C. purpùreum*, Vahl. *Poivrea coccinea*, DC.), from Madagascar. Lvs. oblong-lanceolate, acuminate, evergreen: fls. small, brilliant red, with long-exserted stamens, the handsome loose spikes often in panicles; parts of the fl. in 5's. B.M. 2102. L.B.C. 6: 563.—Handsome.

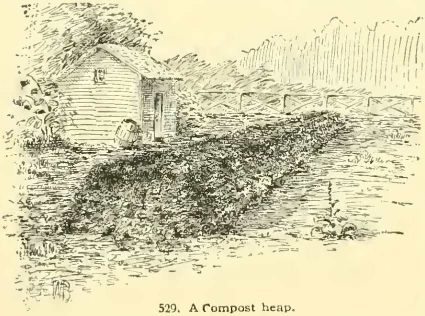
COMFREY. See *Symphytum.*

528. Commelina cœlestis. (× ½.)

COMMELÌNA (to the early Dutch botanists, J. and K. Commelin. A third brother published nothing. Linnæus is said to have meant to designate the two authors by the fully developed petals, and the third by the small petal). Also written Commelyna. *Commelinàceæ.* About 100 widely dispersed perennial herbs, of which a very few are cult. for their interesting flowers. Fls. irregular, the calyx often colored, with unequal sepals; petals 3, the 2 lateral ones rounded or reniform and long-clawed; stamens 6, 3 shorter; capsule 3-loculed. There are several native tradescantia-like species, some erect and others creeping. These are not in the trade. The cult. species are erect warmhouse plants. Some are tuberous-rooted. In the Amer. trade, only **C. cœléstis**, Willd., is offered. Fig. 528. It grows 10–18 in. high, branching, with clasping, long, broad-lanceolate pointed lvs. and blue fls. (2–10 together) on elongating axillary peduncles. Var. **álba**, Hort., has white fls. Var. **variegàta**, Hort., has fls. blue and white. Mex. Prop. by seed, cuttings and tubers. The native **C. nudiflòra**, Linn. (as *C. Sellowiàna*, Schlecht.), is in cult. It ranges all around the world. It is a creeping plant, rooting at the joints, with lanceolate lvs., and small irregular blue fls. in the axils. Commelina is monographed by C. B. Clarke in DC. Monogr. Phaner. 3.

Commelinas are mostly of easy culture, thriving well in any light, rich soil. The evergreen stove and greenhouse species are readily propagated in March or April by cuttings inserted in an ordinary propagating bed and kept close for a few days; while the tuberous-rooted half-hardy herbaceous species may be propagated either by division of the tubers or by seeds sown in a frame early in April and afterwards transplanting the seedlings in the herbaceous border. In the fall, they should be lifted and the tubers stored away in the same manner as Dahlias. Of the tuberous-rooted species, *C. cœlestis* is perhaps the best, its bright blue flowers being very effective, especially when planted in masses.

Edward J. Canning and L. H. B.



529. A Compost heap.

COMPARÉTTIA (Andreas Comparetti, 1746–1811, Italian botanist). *Orchidàceæ*, tribe *Vándeæ*. A small genus of graceful epiphytes, found in equatorial America. Pseudobulbs monophyllous, racemes simple or branched: fls. small, lateral sepals united in a single piece, lengthened at the base into a conspicuous horn; lateral petals converging; labellum large, produced into a double spur, which is hidden in the horn made by the sepals; column free, semi-terete, erect; pollinia 2. Grown on blocks or in baskets in a light intermediate or warmhouse.

coccinea, Lindl. Pseudobulbs small, bearing lanceolate, coriaceous lvs., purple beneath: racemes several-fld., fls. 2 in. across; petals and sepals yellowish, labellum large, broader than long, crimson. Braz.

falcàta, Poep. et Endl. (*C. ròsea*, Lindl.). Similar in habit to *C. coccinea:* fls. deep crimson; labellum broad; racemes pendent. Peru. B.M. 4980. A.F. 6:609.

macroplèctron, Reichb. f. Fls. 10 or more, dorsal sepal whitish, often spotted with purple; midlobe of labellum cleft, suborbicular, magenta-rose, dotted at the angled base; spurs conspicuous. New Grenada. B.M. 6679.

L. H. B.

COMPASS PLANT. Celebrated by Longfellow. It tends to turn the edges of its root-lvs. north and south. Rosin Weed is the prairie name for it. See *Silphium*.

COMPOST. Mixed and rotted vegetable matter, particularly manure and litter. The mixture of bulky fertilizing materials, known as Compost, while of little importance to the general farmer, plays an important part in garden practices. Many of the garden crops must be made in a very short time, or are of delicate feeding habits. Their food, therefore, must be easily assimilable. It is good practice to pile all coarse manures, sods, weeds, or any rubbish available for the purpose, in big flat heaps (Fig. 529), to ferment and rot before being applied to the garden soil. If desired, chemical manures, especially superphosphate (dissolved bone or South Carolina rock) and potash (muriate or kainit), may be added to make the Compost the richer. By spading or forking the heaps over a few times at reasonable intervals, a homogeneous mass is easily obtained, which can be applied in greatest liberality without fear, or more sparingly, in accordance with the needs of the particular crop. Of equal, if not still greater importance, is the Compost heap which gives soil for greenhouse benches, flats, hotbeds and coldframes. This Compost is principally made of sods shaved off a rich pasture or meadow and piled in alternate layers with stable manure, more of the latter being used for forcing succulent crops, and less in growing plants which should be short and stocky, like cabbage or tomato plants. Garden litter may be added to the pile, as leaves and trimmings. All Compost heaps, during dry weather, need frequent and thorough moistening with water, or, better, with liquid manure. Turn several times during the year, to ensure thorough rotting of the materials.

T. Greiner.

COMPTÒNIA (after Henry Compton, Bishop of London, patron of horticulture, d. 1713). *Myricàceæ*. One species, by some authors united with Myrica, from which it differs in the pinnatifid, stipulate lvs. and 8 linear, persistent bractlets subtending the ovary. **C. asplenifòlia**, Gærtn. (*C. peregrìna*, Coulter. *Myrìca asplenifòlia*, Linn.), the Sweet Fern, grows in dry, sterile soil in the eastern U. S., and is also in the trade. It is an attractive undershrub (1–3 ft.) with fern-like, scented foliage and brownish, axillary heads of imperfect fls. Lvs. linear, pinnatifid: roots long and cord-like. Useful for foliage masses on rocky or barren places.

L. H. B.

CONE-FLOWER. The genus *Rudbeckia*. The Purple Cone-flower, however, belongs to the allied genus *Echinacea*.

CONÁNDRON (*cone-shaped anther*). *Gesneràceæ*. **C. ramondioìdes**, Sieb. & Zucc., of Japanese mountains, is the only species. It is an interesting little tuberous-rooted herb, with oblong, rugose, serrate root-lvs. and scapes bearing 6–12 white or purple, nodding Dodecatheon-like fls. It is one of several groups of rare and widely scattered herbs, of which Ramondia, Haberlea, Wulfenia, Didymocarpus, Shortia and Schizocodon are examples. Conandron is adapted to growing in shady rockeries. Scapes less than 1 ft. high. Little known in cult., but is in the trade. B.M. 6484.

CONIFERS. The cone-bearing trees (*Coniferæ*) are decidedly the most important order of forest trees in the economy of civilized man. They have furnished the bulk of the material of which our civilization is built. The remarkable combination of strength and stiffness with the smallest weight compatible, and the abundance and gregariousness of their occurrence, gives them this important position. From the standpoint of the horticulturist, they also take a prominent place among the materials for landscape gardening effects, and, in the more practical use, as windbreaks. Their evergreen habit—for all except the larch and ginkgo tribes are evergreen—and their conical form, especially in earlier periods of life, with a branch system persisting to the base for a long time, are the elements which make them desirable. To these graces may be added the peculiar form and striking coloring of their foliage, which, in combination with deciduous trees or in clumps, by themselves or in single specimens, offer striking effects.

There are two types of natural or native beauty in the Conifers—the symmetrical and verdurous beauty of the young specimen (Figs. 530, 531; Fig. I, p. 1), and the picturesque and rugged beauty of the old and time-worn tree (Figs. 532, 533). Aside from these, there are also odd, grotesque and formal cultivated varieties, as typified in the weeping spruce (Fig. 534), the columnar junipers (Fig. 535), and the various dwarf pines and spruces (Fig. 536).

The majority of the species belonging to this group, as well as their greatest numerical development, is found in the temperate zones, only a few belonging to subtropical or tropical countries, among which are the Araucarias, from South America; the Dammara, Dacrydium, and Phyllocladus, from Australia, etc.

The order Coniferæ comprises nearly 40 genera, and about 300 species. Our own native flora, with 15 genera and not less than 100 species and subspecies, is among the richest, the bulk of these being found on the Pacific coast. The Atlantic side offers 28 species, representing the genus Pinus with 12 species out of 39; 1 Larix out of 3; 3 Piceas out of 7; 2 Tsugas out of 5; 2 Abies out of 12; 1 Taxodium; 1 Thuja out of 2; 1 Chamæcyparis out of 3; 3 Juniperus out of 11; 1 Tumion (Torreya) out of 2; 1 arborescent Taxus out of 2: being without representatives of the genus Pseudotsuga, Sequoia, Libocedrus, and Cupressus. There are to be added a large number (not less than 400) of nurserymen's varieties, which have been enumerated in Bull. 17 of the Division of Forestry, U. S. Dept. of Agriculture.

There are also a number of exotic Conifers which promise satisfactory results if used in suitable localities, climate and soil. The Norway Spruce (*Picea excelsa*) recommends itself by its elegant gothic form, often with pendulous branchlets, its very rapid growth, and its wide adaptation to soils and climates, together with its ease of propagation and cheapness. It excels in form and rapidity of growth most of the American spruces. Like all Conifers, after the 25th to 40th year it must pass through a period of change in form, during which it loses, for a time, its shapeliness. The Scotch Pine (*Pinus sylvestris*) has nothing to recommend it which may not be found in native species, except, perhaps, adaptation to the dry climate of the west, and cheapness. The Austrian Pine, on the other hand, is an acquisition by its stout growth in its youth, although the Red Pine (*Pinus resinosa*) would probably do as well; so far, its small cones and seed have made the latter expensive. The European Larch outgrows the native northern one easily, but *Larix occidentalis*, from the interior basin, will probably do as well or better. There is no particular commendation for the Europe Fir, but the Nordmann Fir, from the Caucasus, is a most decided aquisition, by its beauty and adaptation; so is the most graceful of all spruces, *Picea orientalis*, while the Spanish *Abies Pinsapo* will always attract attention by its peculiar shape and foliage.

530. The beauty of young evergreens lies in their symmetry and the preservation of the lower limbs.

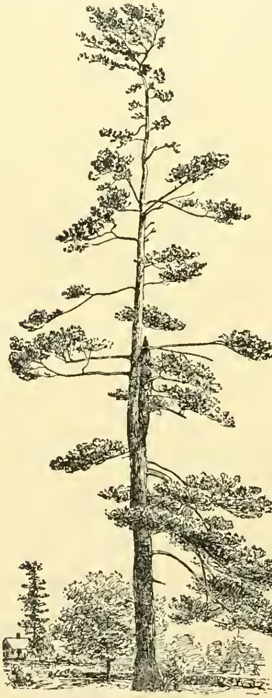
Of other ornamental forms which are without representatives in the U. S., and hence fill vacancies, may be mentioned, as capable of adaptation, and, more or less in use, from South America, the Araucarias; from Africa and Eastern Asia, *Cedrus Deodara*, *Libani*, *Atlantica*, *Abies Appolinis* and *Cilicica*; from Korea, the promising, more densely foliaged White Pine, *P. Koraiensis*; from China, Cunninghamia, Biota, Glyptostrobus, Cephalotaxus, Podocarpus, Pseudolarix, and, above all, that interesting remnant of former ages, the Maidenhair-tree, *Gingko biloba*, which will maintain itself anywhere along the Atlantic coast if propagated from seed of the proper localities. Japan has furnished a number of additions, especially Retinosporas, Torreyas, Taxus, various Pinus, Piceas and Tsugas, with the peculiar *Sciadopitys verticillata*, the Umbrella Pine, and, the most acceptable of all, the graceful *Cryptomeria Japonica*.

531. A good spruce tree.

As with all introductions from one country to another, nay, from one climatic region to another, caution is advised, so it may be laid down as a rule, that exotics should be used with great discretion, and, until their adaptation is amply demonstrated, only in a subordinate manner. If it is in general true that perennial plants can only be transplanted with permanent success into similar climatic conditions, it must be especially true with the conifers, which do not lose their foliage, and hence must be able to bear summer as well as winter conditions. The Long-leaf Pine of the south, most striking of our pines, may, therefore, not be transplanted far beyond its northern limit, and, if we desire to utilize any of the Pacific coast species in the east, we will have to secure them at least from the highest and driest altitudes and exposures or, if, as in the case of some species, like the Douglas Fir and Engelmann Spruce, their field of distribution covers the dry slopes of the Rocky mountains as well as the moist slopes of the coast ranges, we may be successful if we choose our plant material from these drier slopes.

Of the many native species, we may discard a number that are not of any particular value, although the distinction could be more readily accomplished from the economic point of view than from the standpoint of the horticulturist and landscape gardener, for almost every one has a distinctive feature of either form or adaptation to soil or other interest. For each climatic region the choice must be different; hence it would be impossible to give, in the brief space of an article, intelligent advice as to best selections. In general, besides climatic limitations, the following considerations may serve in the choice of native species. The pines, as a rule, are not to be placed on compact, clay soil, and, on account of their taproot, not on shallow soils, on which they soon become spindly; they thrive best on loose, sandy soils, and can endure dry soils, the White Pine adapting itself perhaps best to the clay soils without detriment to its development. On wet soils pines are, as a rule, decidedly out of place, although the Red Pine (*P. resinosa*), of the north, and the Loblolly (*P. Tæda*), and some other southern species are capable of supporting such conditions. For such situations here, however, the cedar tribe furnishes better material,—the Chamæcyparis, Thuyas and Taxodium. These trees of the bog and swamp are, however—it should not be overlooked—capable of thriving even better on drier soils. They are merely indifferent to moisture conditions at the foot.

The shallow-rooted spruces are trees of the higher mountain ranges, and are, therefore, more adapted to moist and cool situations, although some of them, the Norway Spruce, the Blue Spruce of Colorado and the northern White Spruce will—the former, at least, during its juvenile period—endure more droughty situations. The firs, too, are rather more species of northern climates and high altitudes, the Red Fir, so-called (*Pseudotsuga taxifolia*), which is not a fir proper, being, perhaps, best capable of supporting drier and hotter situations. The most ornamental, and, in many respects, most serviceable of the firs, *Abies Nordmanniana*, from the Caucasus, develops its magnificent dense and dark green foliage in the warm but moist climate of Washington, while our most ornamental *Abies concolor* from Colorado will thrive even in our drier atmospheres of the Middle states. The fine firs of the Pacific coast will probably not thrive anywhere in our drier and hotter eastern climates for any length of time, unless placed in cool and shady situations.



532. A lone field pine, remnant of a forest.

The Douglas Fir (*Pseudotsuga taxifolia*) is, perhaps, most readily acclimated if seed is secured from the dry slopes of Colorado. The Lawson Cypress (*Chamæcyparis Lawsoniana*), with its graceful pendulous branches and foliage, and the pyramidal *Libocedrus decurrens* are unquestionably desirable additions to our ornamental stock, while the Sequoias, especially *Washingtoniana*, the Big Tree, has shown itself capable of thriving in the latitude of Rochester.

One important feature which enters into consideration when grouping Conifers, is the relative endurance of shade or tolerance which the species exhibit, thereby indicating their use in various positions. The yews and firs are the most tolerant of shade, together with the hemlocks; next may be placed the spruces, Arborvitæ (Thuya), and Juniperus, while the pines are mostly intolerant of shade, excepting the White Pine, which is the most shade-enduring of the pines; the larch and the bald cypress are the most light-needing of all, and will perish soon if placed under the shade of any other trees. All species, to be sure, are capable of more shade-endurance when young and on deep, moist soil. Their relative shade endurance under the same conditions remains, however, the same, and may be studied in the forest by observing the density of the individual crowns, the capacity of maintaining a thrifty foliage under the shade of different species, and especially of young plants to persist in such shade.

Propagation.—Most Conifers ripen their fruit in the fall, September to November, and are best gathered soon after or before ripening. The pines take two years to mature their cones. White Pines ripen fruit in the first two weeks of September, and the cones opening, shed the seeds at once, the empty cones remaining on the branches. The cones of the firs fall apart upon ripening, hence must be gathered before being quite ripe. Spruces and hemlocks shed seeds from time to time, opening and closing into next spring. Some pines, like *Pinus pungens* and *serotina*, keep their cones closed for years, and artificial heat must be employed to make them open and give up their seed. In gathering seeds for the trade, such artificial heat is frequently applied with pines in specially constructed seed roasters; such seed should be carefully inspected, as it sometimes suffers from improper use of the heat.

The proportion of germinating seeds, and the vitality, i. e., the ability of retaining germinative power, varies greatly not only with the seasons in the same species, but from species to species.

The lowest germination percentage and vitality is found in firs and larch, which show rarely more than 50 per cent of good seed, and soon lose their vitality, while spruce and pine, when entirely fresh, may show as much as 95 to 100 per cent germination, and retain vitality for 2 to 5 years, losing each year a proportion, Norway Spruce 5 years old still having 10 per cent germination.

In trade, a germination percentage for spruce of 75 to 80; pine, 70 to 75; fir, 30 to 50; larch, 20 to 40, should be acceptable.

Seeds are best kept in a dry, cool garret in tight bags or boxes, excluding the air as much as possible.

All seeds require a short rest or after-ripening of two to four weeks before they are ready to germinate, and some, like the Taxus and Juniper, lie over, even in nature, for a year or more before they germinate. The latter should be prepared for sowing by macerating them, and removing the pulp in hot water, then mixing with sharp sand in bags, and by friction freeing the seed from the pulp.

In the seed-bed somewhat more care is required than with most other species of trees. A thoroughly mellow, well pulverized seed-bed of light, loamy sand, possibly enriched with well decomposed manure (cow-dung better than horse-dung), is required, the covering of the seed varying, according to size, from a mere sprinkling for larch to one-quarter inch for the heavy-seeded pines. They may be sown as soon as the weather is settled, in northern latitudes the second or third week in May, best

A good group of young Conifers

in rows not more than 6 inches apart, and preferably in dry weather, when the soil does not clog, which sometimes prevent seeds from germinating, and can be rolled over them. Mulch between the rows with pine needles or sphagnum moss, or other fine mulch, to reduce necessity of watering and weeding. Conifer seeds need very little water for germination. The seeedlings, on the other hand, for the first three months, until they have made their crown bud, need to be either kept well watered or else protected against the drying effects of sun and wind by shading, for which purpose lath screens are best. These latter must be lifted for airing after the sun is gone, especially in muggy weather, to avoid "damping-off." For wintering, a covering with conifer branches or very clean meadow hay is advisable (the latter is apt to bring in weeds).

533. Picturesque old hemlock spruces.

For growing small quantities, the use of boxes, as described by Jackson Dawson, of the Arnold Arboretum, in Proceedings of the Massachusetts Horticultural Society, is highly commendable. In well drained boxes, sow the seed soon after gathering, pile four or five deep in a pit or sheltered place, cover with boards, and when cold weather comes, cover up with leaves or hay. About the middle of April, move them into a place where they get the early morning sun. Keep the seedlings well watered and free from weeds, and shaded as described. Winter the seedlings in same manner as the seed-boxes, well covered up. They are ready for transplanting next spring, when they are making their first or second set of rough leaves.

Since pine and spruce seedlings take about 7 to 10 pounds of phosphoric acid, 10 to 20 pounds of potash and 15 to 30 pounds of lime, besides 20 pounds of nitrogen, per acre from the soil, for continuously used nurseries the addition of mineral materials in the shape of bone-meal and wood-ashes may become desirable.

A large number of seedlings may be grown in a small space; thus 30,000 Norway spruce may be grown on a square rod, requiring about 2 pounds of seed. The quantity of seed sown depends, in part, upon the length of time it is expected to leave seedlings in the seed-bed, besides size and quality of seed; the quantities vary from ¼ to ½ pound per 100 square feet if sown in drills, and the yield of seedlings will vary from 200 to 15,000 seedlings, according to species and seasons.

Conifers, like any other trees, may be transplanted at any time of the year, provided the necessary care is taken in moving the plant. This care is least required, as with other trees, in the fall and early spring, when activities of root and foliage are, if not at rest, at least reduced. Which of these seasons is preferable depends on the locality, and the dependent character of the season. On the whole, spring planting will probably be preferable in most parts of the United States which do not suffer from dry spring winds. In localities of the southwest, which have commonly a dry spring followed by a rainy season in July, this latter time should be chosen. There is a belief that planting in August is specially favorable. We see no reason for this belief, unless favorable weather (a rainy season) follows.

Conifers may be transplanted later than deciduous trees, even after the buds have started, excepting the larch, which buds out very early; with this species, fall planting may be recommended. Cloudy weather, rather than rainy or very dry, should be chosen, especially when transplanting into nursery rows.

Young trees are naturally more readily and successfully transplanted than older ones, with which there is more difficulty in securing the whole root-system when taking them up. Since, however, the seedlings develop slowly for the first one or two to three years, they should be left in the seed-bed for that length of time, root-pruned, and then transplanted into nursery rows. Although those with a shallow root-system, like spruces and firs, may be moved even when 30–40 feet in height, it is best, even for ornamental purposes, not to take them more than 3–4 feet in height. In forestry, 1- to 4-year-old plants, according to species, from 2–12 or 15 inches in height, are preferred for reasons of economy.

534. A weeping Norway spruce.

Much greater care than with deciduous trees is necessary, when transplanting without an earth-ball, in keeping the root fibers from drying out; a large amount of loss in transplanting is explained from neglect in this respect. As soon as taken up, the roots should be immersed into a loam-puddle and kept protected by wet sphagnum moss or canvas until set into their new place.

The question of trimming when transplanting must be considered with more care than is necessary with broad-leaved trees, which possess much greater recuperative power. It should be confined to the smallest amount, smoothing bruised roots, and if for proper proportioning pruning at the top becomes absolutely necessary, shortening the leader rather than branches. Larch will stand more severe pruning than most other Conifers. From the artistic as well as physiological point of view, it is barbarism to remove the lower branches, which the tree needs to shade its trunk and standing room, and often, when deprived of the same, will replace first before starting again in its height growth. Attention should, however, be especially paid to preventing double leaders, which are detrimental to future form-development; cut them out as early as possible, preferably in the bud. Laterals may be somewhat shortened-in while standing in the nursery, to lengthen the time during which the lower branches are to persist. Breaking out buds is, as with all trees, the best method, provided the pruner has an eye for his business. Even in after-life, when pruning is done to keep the tree shapely, the minimum use of the pruning-knife should be the rule.

There are three marked periods in the development of Conifers—the juvenile period, when the entire tree is a crown, branched symmetrically to the base, the perfection of symmetry; then follows the adolescent stage, when the lower branches die out, a period of unshapeliness; followed by the virile stage, when the straight, cylindrical shaft bears the crown at one-third or one-half of the upper length of the bole. The trimming during the adolescent stage requires most consideration. It is, in most cases, best only to take off the lowest, dying or dead branches, as it becomes necessary.

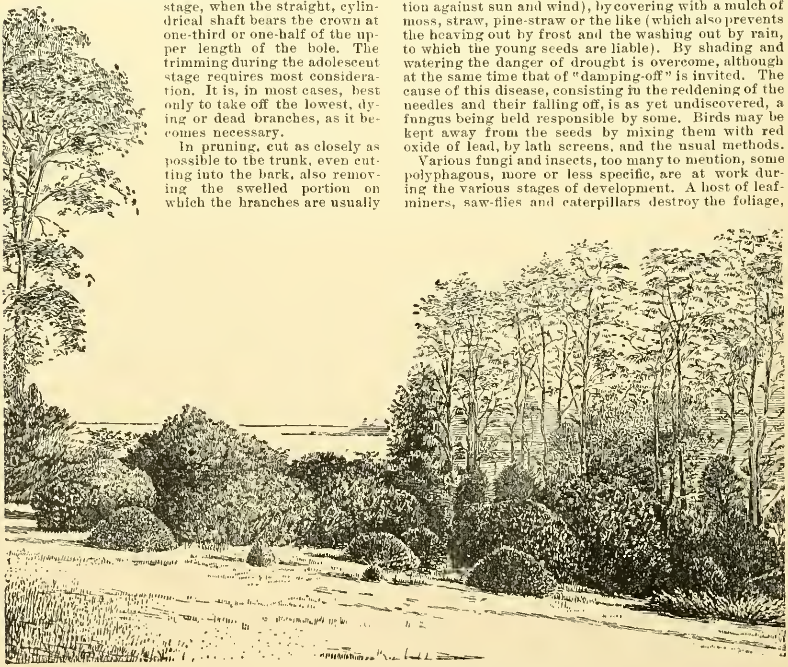
In pruning, cut as closely as possible to the trunk, even cutting into the bark, also removing the swelled portion on which the branches are usually inserted, when the callusing will be more rapid and satisfactory in shape.

If at this stage or at any time the trees show trouble at the top by drying (becoming "stag-headed"), it is a sign that they suffer at the root from lack of moisture. Trimming off a few tiers of lower branches, loosening the soil as far as the ambitus of the crown, and mulching will largely correct this. When used for hedges, the treatment is, of course, different. For such a purpose the shade-enduring species, spruces and hemlocks, are best, since they are capable of preserving a dense interior foliage, while the pines are bound to thin out.

535. Pyramidal evergreens. Junipers.

There are a number of dangers and damage from insects to which Conifers are exposed. Drought and frost are most dangerous to seedlings in the seed-bed. These are obviated by proper location of the seed-bed (protection against sun and wind), by covering with a mulch of moss, straw, pine-straw or the like (which also prevents the heaving out by frost and the washing out by rain, to which the young seeds are liable). By shading and watering the danger of drought is overcome, although at the same time that of "damping-off" is invited. The cause of this disease, consisting in the reddening of the needles and their falling off, is as yet undiscovered, a fungus being held responsible by some. Birds may be kept away from the seeds by mixing them with red oxide of lead, by lath screens, and the usual methods.

Various fungi and insects, too many to mention, some polyphagous, more or less specific, are at work during the various stages of development. A host of leaf-miners, saw-flies and caterpillars destroy the foliage,

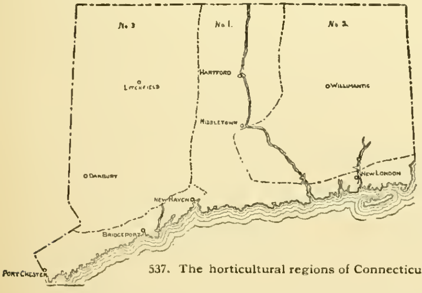

536. Dwarf conifers, of horticultural origin. Pines and spruces.

and weevils sap the young shoots. Bostrichi, or bark-beetles, mine under the bark, mostly of trees which are sickly from other causes; borers enter the wood of the boles. Tortrices bore into the base of leaders and cause them to break off. The best remedies against most of these are preventives, namely: providing the trees with such chances of vigorous growth, or satisfactory soil conditions, that they are able to ward off or overcome the enemies. Otherwise, watching and destroying the enemies in time, and the usual remedies to kill them, may be employed. Literature: Veitch, Manual of Conifers; Carrière, Traité des Conifères; Beissner, Handbuch der Nadelholzkunde.

B. E. Fernow.

CONÌUM maculàtum, Linn. *Umbelliferæ.* The Poison Hemlock, "by which," as Gray writes, "criminals and philosophers were put to death at Athens." It is a rank, much-branched European herb which has run wild in eastern N. America, and which is offered in the trade as a border plant. It is biennial, rank-smelling, and poisonous, and is scarcely worth cultivating, although the finely cut dark foliage is highly ornamental. It grows from 2–4 ft. high, and has large umbels of small white fls. An extract is sold in drug stores for a sedative. For this purpose the fruit is gathered while green.

CONNECTICUT, HORTICULTURE IN. Fig. 537. While one of the smallest states and covering but one degree of latitude (41 to 42), owing to the great diversity of soil and varying elevations from the sea level, along the whole southern border, to 900 and 1,200 feet in sections of Tolland county, and 1,200 and 1,500 in portions of Litchfield, Connecticut is adapted to as wide a range of horticultural productions as any state outside of the semi-tropic fruit belt. The "season" of many of the quick-maturing species and varieties of fruits, flowers and vegetables is often entirely over on the light soil in the Connecticut valley and along the Sound shore when like species and varieties are but just beginning to ripen on the cooler, moist soils of the hills of Tolland and Litchfield counties. Strawberries and green peas from East Hartford and Glastonbury supply the Hartford market, while on the Bolton hills, only 12 miles away, the blooming vines give promise of the crop that is to come after the valley season is entirely over; so that "home-grown" strawberries are usually to be had in the Hartford market for a period of six or seven weeks. The Sound shore, Housatonic valley and Litchfield hills supply New Haven, Bridgeport and other cities of the state through equally long seasons.



537. The horticultural regions of Connecticut.

From the earliest settlement of the state, fruit-growing for the family home-supply has been a prominent feature of Connecticut agriculture, the apple being a main reliance. The old seedling trees scattered over all our farms to-day are plain evidence that our ancestors took their apple juice through the spigot of the cider barrel rather than fresh from the pulp of the ripe fruit of some finer variety. A hundred years ago every farm-house cellar wintered from 30 to 50 barrels of cider, while to-day it is hardly respectable to have any, and probably not one family in ten now has even one single barrel on tap as a beverage. Yet in quantity and variety the family fruit supply has wonderfully increased and a daily supply of fresh home-grown fruit is the rule rather than the exception in most farm homes, —small fruits in variety, apples, pears, peaches, plums (both European and Japan), cherries and quinces, in all the best standard varieties, coming to their highest perfection in every section of the state where rational methods of culture are followed. The topography of the state is such, and soils are so varied within short distances, that it is difficult to district the state, except in the most general way. Aside from the alluvial, most of the light sandy and sandy loam lands are along the river valleys and the Sound shore; while in "the hill towns" and along the ridges the soils are heavier, with more or less mixtures of clay, and many of the hilltops are moist and springy. Rocks are very abundant nearly all over the state except in the valleys, while the natural timber and semi-abandoned farm and pasture lands, growing up to brush and timber, cover fully one-half the acreage of the state. Acting at present as wind-breaks and climatic equalizers, they will in the future furnish the "new lands" for extensive horticultural enterprises. Lying midway between New York and Boston,—the greatest horticultural markets of America—Connecticut is better situated than any other state in the Union to realize quick cash returns from her horticulture. Every farm is within driving distance of some one or more of her own busy manufacturing towns and villages, whose people are appreciative of choice fruits and are able to pay for them.

District No. 1.—This comprises the Connecticut river valley and adjacent hills, along the Northampton branch and the main line of railroad from Hartford to New Haven, and all of the shore towns. This district contains most of the sandy plain lands of the state, and the loams and clay most free from rocks and stones. On the hills back from the river, on the ridges either side of the railroads, and a few miles back from the Sound shore, there are many places where soil and topographical conditions are much the same as in districts Nos. 2 and 3; but, having much larger tracts of easily cultivated lands and being better located as to market conditions, this district is more highly developed horticulturally than either of the others. Here are the great market-gardens and small-fruit farms, peach orchards, vineyards and melon fields.

District No. 2.—This district comprises Tolland and Windham counties and all of Middlesex and New London counties except Cromwell and the shore towns, and is particularly well suited to apple and peach culture, owing to the rolling condition of the country and natural fertility of many of the hills. Every few miles are little valleys and pockets suited to the production of small fruits and vegetables in variety. A few townships in the northeast grow apples quite extensively, while in the west and southwest commercial peach orchards are found to considerable extent.

District No. 3.—This district comprises western Hartford, northwestern New Haven, northern Fairfield, and all of Litchfield counties, and is somewhat similar to district No. 2, except that the soil is generally heavier, with rather more mixture of clay and the hills are more abrupt and rocky. Some sections of Litchfield county are too cold and bleak for any but the most hardy fruits.

Apples grow freely everywhere, and, while always of good quality, the brightest colors, firmest texture and highest quality of fruit is produced on the rocky hills, at an elevation of from 400 to 1,000 feet. Baldwin, Rhode Island Greening, Roxbury Russet and Spy are the leading varieties, although all the varieties that thrive well in the northeastern U. S. grow to perfection here when properly cared for. Old commercial orchards have always been profitable, and just at this time large plantings are being made, the largest orchard in the state containing about 4,000 trees.

Peach culture on an extended scale is a recent development. Eighteen years ago the only commercial orchard in the state contained about 2,000 trees, and probably

5,000 trees would be a liberal estimate for the state; now upwards of 2,000,000 peach trees are in the state—many orchards of 5,000 and 6,000 trees, quite a number with 10,000 to 15,000 trees, and at least one with nearly 50,000. While many varieties are grown to some extent, the main plantings are of Mountain Rose, Oldmixon, Crawford Early, Crawford Late and Stump. More recently, however, Waddell, Carman, Champion and Elberta have been heavily planted. High culture, close pruning and a thinning of the fruit are generally practiced, and fruit of brightest color, largest size and high quality is thus secured. In the markets of this and neighboring states, "Connecticut peaches" usually sell at a much higher price than those from any other section. The only serious drawback is the winter-killing of the fruit-buds in the valleys, this happening probably three years out of five, while on many hillsides and hilltops at least two crops out of three are assured; but there are many favorable localities where annual crops are almost a certainty.

Japanese plums were early planted in this state, and so quickly proved their adaptability to soil and climate that they are now planted in a small way in every section of the state, fruiting almost as freely as the apple, for family supply, while in a commercial way they are being quite largely planted in district No. 1. Several orchards have from 2,000 to 4,000 trees each. Of varieties longest tested, Burbank, Abundance and Chabot are most satisfactory and profitable. Red June and Satsuma are rapidly growing in favor, the latter commanding extremely fancy prices for canning purposes.

Raspberries, blackberries, currants and gooseberries grow and produce freely all over the state, and all local markets are abundantly supplied in season.

Grapes can be grown successfully all over the state, except on the highest and coldest hills; and on the sandy plains and warm, rocky hillsides all the best standard varieties can be produced in perfection. There are a number of small vineyards in district No. 1, and home-grown grapes sell for double the price of those coming from the outside; yet, on the whole, the grape industry is but lightly thought of.

Pears thrive and fruit well except on the lighter lands, and nearly every home garden has from one to half a dozen trees. There are a few small commercial orchards in district No. 1, Bartlett and Clapp being most largely grown at Hartford and the adjoining towns. On the west side of the river the Bosc is produced in its highest perfection.

Cherries have been steadily failing in the state for twenty-five years past. Not enough for home supply are grown. Newly planted trees soon die out, and there is a general discouragement. They seem to do best in the vicinity of Middletown and Meriden, and the few commercial orchards there are quite profitable.

Quinces are grown all over the state for home supply, but thrive best along the Sound shore, where there are a large number of small commercial orchards.

Strawberries are very largely grown, both for home and outside markets, mostly in medium matted rows, with an average yield of 80 to 90 bushels per acre. Some cultivators, who follow the hill system or grow in narrow, thinly matted rows, secure 150 or more bushels per acre. A number of the berry farmers have systems of irrigation which add greatly to the surety of the crop, besides increasing the size and appearance of the fruit. The rolling character of the country and vast number of small streams abundantly supplied with water make it possible, at moderate expense, to irrigate many thousands of acres in this state, and the time is not far distant when the streams of Connecticut will be more valuable to her horticulturists than they ever were to her manufacturers in the old days of many small factories and water-wheels.

Almost from the earliest settlement, small local nurseries have abounded in the state, and are here to-day to the number of 53. An extensive general nursery at New Canaan, in Fairfield county, is much the largest of any in New England, while the small fruit and specialty nursery at South Glastonbury, Hartford county, distributes plants by the million all over the world. At Cromwell, Middlesex county, is a floricultural establishment which, with one exception, has the largest area under glass of any such establishment in America, and surpasses all others in the annual production of superb roses.

The late Judge A. J. Coe, of Meriden, was one of the first men in America to take up the new chestnut culture by the importation of the best foreign varieties and the selection of the best natives and their crosses. He commenced the grafting on native sprouts and seedlings, and stimulated quite a general chestnut grafting, so that a goodly number of chestnut orchards are being established on land too rough for cultivation, yet strong in its ability to grow the chestnut tree and nut to perfection.

At Wethersfield, in Hartford county, Orange and Milford, in New Haven county, and Southport, in Fairfield county, are many farms devoted to seed-growing. Onion seed and sweet corn are the great specialties, but a great variety of other seeds are also grown, especially at Wethersfield and Orange.

Market-gardening is carried on quite extensively by specialists near all large towns and cities, while, with so many good markets always close at hand, vegetables and fruits are sold in moderate quantities from nearly every farm. The largest general market-garden farm is at New Haven, where over 400 acres are under annual cultivation with vegetables and small fruits. At Southport, Fairfield and Westport there are many farms, both large and small, devoted entirely to the production of onions. "Southport onions" are famous for fine appearance and quality, and nowhere in America is the annual yield so great or price received so high as in this district. Marketing is done in sailing vessels direct from the farms to the dock markets in New York, where the onions are sold direct to retail dealers, boat captains acting as salesmen without commission for the sake of carrying the freight.

Trolley car lines are widely extended through many farming sections of the state, and, running express cars at certain hours of the day with freight movements at night, they are proving quite a factor in the distribution of horticultural products. The Hale peach farms, at South Glastonbury, were the first in America to use this new electric power in the marketing of their products. Fruit is loaded at the farm side-track as gathered during the day, and transported to market at night, after passenger service has closed for the day. It is unloaded in the city from the main-line tracks directly in front of the stores in the early morning hours before the tracks are again required for passenger service, and the empty cars are returned to the farm side-track before a new day's work in the orchard has begun.

The Connecticut Pomological Society, organized some ten years ago, is a prominent feature in the lively fruit interests of the state. It has a large, active membership, and, aside from its annual winter meeting, it holds each summer three or more "field meetings," on fruit farms in different sections of the state, and there, around tree, plant and vine, the members meet and discuss the live topics of the hour, gathering inspiration which, carried to their homes, is pushing Connecticut into the very front rank of horticultural states.

J. H. Hale.

CONOCÉPHALUS (Greek, *cone head*). One of the liverworts (Marchantiaceæ), with broad, flat, forking evergreen thallus, growing on moist banks, like a moss. *C. cónicus*, Dumort., is offered by collectors as a plant for rockeries.

CONOCLÍNIUM (Greek, *cone* and *bed*). *Compositæ.* Differs from Eupatorium in having a conical receptacle and the somewhat imbricated involucral scales nearly equal. Most authors now unite the species with Eupatorium (which see).

cœlestìnum, DC. (*Eupatòrium cœlestìnum*, Linn.). Mist Flower. Perennial, 1–2 ft. high, somewhat pubescent: lvs. opposite, stalked, triangular-ovate and somewhat cordate, coarse-toothed: heads in compact cymes, many-fld., blue or violet. Mich. and Ill., to N. J. and S.—Late-blooming heliotrope-fld. plant, very useful for low borders.

Lasseàuxii, Dur. (*Ageràtum Lasseàuxii*, Carr.). Spreading pubescent perennial, with habit of *Agera-*

Lilies-of-the-Valley. (See Convallaria)

tum conyzoides: lvs. lance-elliptic, obtuse-toothed, long-attenuate, short-stalked or somewhat decurrent: heads numerous, handsome rose-color Uruguay. R.H. 1870:90.—Handsome plant for bedding. Grows 1–2 ft. high. Not hardy.

L. H. B.

CONOPHÁLLUS Kónjak, Schott, is *Amorphophallus Rivieri,* var *Konjac,* Engler. The great tuber is much grown in Japan for the making of flour (see Georgeson, A.G. 13:79). *Amorphophallus Revieri* is figured on p. 59; also in R.H. 1871, p. 573; and in B.M. 6195 (as *Proteinophallus Revieri*). Konjak is offered by importers of Japanese plants.

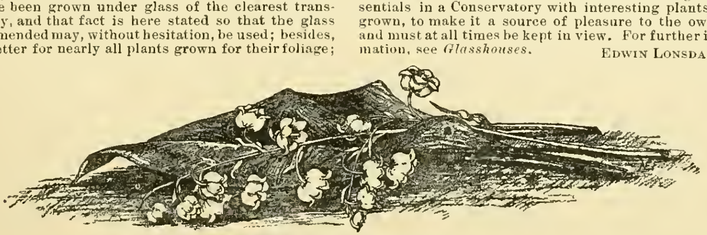
CONSERVATORY. Literally, a place in which things are kept or preserved. Used to designate a glass house in which plants are kept for display, rather than for propagating or growing.

Every well-ordered private establishment should have a Conservatory wherein to display to the best advantage the plants which have been brought to their attractive state in the greenhouses and hothouses thereon, and the nearer it is located to the residence, all other things being equal, the better. It would be best if it were a part of it. Many architects, in preparing plans and arranging for the erection of Conservatories, look more to the architectural beauty of the structure rather than to the well-being of the plants to be grown therein. One of the worst faults hitherto has been inadequate ventilation. A practical grower of plants should always be consulted upon this essential point before definite arrangements for building are made. In addition to a generous opening in the roof, which should, in all cases, be operated by one of the most approved lifters to be had, the sides also should have door openings that may be easily manipulated. The foundations may be made of any substantial material, either of stone, brick or concrete, and the wall should extend 2 ft. 6 in. or 3 ft. high above the ground-line and up to where the glass begins. Hollow brick walls are considered the most satisfactory, if the house to which the Conservatory is to be attached be built of stone or brick, being less amenable to the winter extremes in temperature, when outside the thermometer may register zero, and inside 55° or 60°. The glass from the wall to the eaves should be of good quality, and as transparent as possible, but that on the roof should be the translucent, "frosted" or ground glass. Contrary to the general belief, rose blooms of as fine quality have been produced under ground glass in the climate of the United States as have been grown under glass of the clearest transparency, and that fact is here stated so that the glass recommended may, without hesitation, be used; besides, it is better for nearly all plants grown for their foliage; and the beauty of flowering plants in bloom may be conserved much longer than it is reasonable to expect they would be under the more or less glaring unobstructed sunlight.

The interior arrangement of a Conservatory is a question to be decided largely by the owner and gardener in charge, and is largely a matter of taste, although convenience in operating must never be lost sight of. The former depends upon the individuality of those most interested, and the latter must, in all cases, be provided for, if the best success in plant-growing is to be achieved. The table or stage along what might be termed the front, or nearest to the outside of the Conservatory, should be high enough to give a pleasing general effect and yet such that each individual plant may be examined at pleasure; and at the same time the table should be low enough that the pots in which the plants are growing may not be seen through the glass from the outside.

Some large plants may find a permanent home in the Conservatory, such as vines, to be trained on the rafters and girders, if the size and style of the building will allow of their training and proper care. Other large plants, as palms of the various species and varieties, can also be used to advantage. The great trouble with many of the vines and other plants growing permanently therein, is their proneness to insects in such structures, and the methods generally in use for their extermination, put into operation in a Conservatory attached to a residence, are out of the question in most cases. We refer principally to the old style method of fumigation by burning tobacco for the destruction of aphis. Experiments are being made in the uses of different gases, and by vaporizing insecticides, which may allow of this part of the cultivation of flowers and plants under glass to be made less disagreeable for the operators and for the owners of Conservatories in the future than it has been in the past. For the destruction of the various scale insects and mealy bug, sponging by hand is generally resorted to, but it is a slow and tedious process. Syringing with a weak solution of tobacco water once or twice a week will kill the scale, and aid in keeping down mealy bug, especially if a strong pressure of water, when syringing, can be brought into requisition. The aphis, before referred to, or what is generally called "green-fly," affects only what are termed soft-wooded plants, and as they are only brought in when at their best, should be entirely free from that pest before they leave the greenhouse, in which they have been brought to their most interesting and showy stage. Sometimes, however, no matter how much care has been exercised, some of these pests will be found on the plants, and as they increase very rapidly, some means will have to be resorted to for their extermination. Fumigation, by burning tobacco stems, is out of the question, but tobacco dust,—the sweepings of a cigar factory,—when burning is not at all disagreeable, leaving little more smell than the burning of a good cigar. Liquid tobacco extract is often used with good effect by evaporation, using hot irons in the liquid. This has its objections, being somewhat clumsy to operate. Evaporating pans attached to the heating pipes, in which the liquid, somewhat diluted, is placed, are effective, and are not at all disagreeable. Cleanliness and neatness are the great essentials in a Conservatory with interesting plants well grown, to make it a source of pleasure to the owners, and must at all times be kept in view. For further information, see *Glasshouses.*

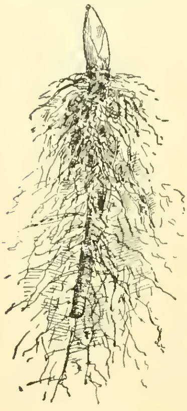
EDWIN LONSDALE.



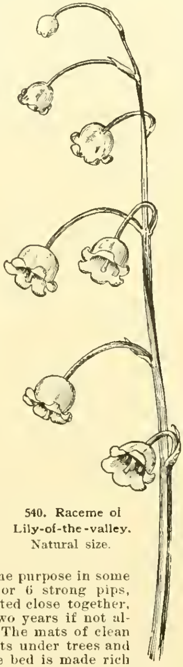
538. Spray of Lily-of-the-valley (×½).

CONVALLÀRIA (old Latin name, derived ultimately from *convallis,* a valley). *Liliàceæ.* LILY-OF-THE-VALLEY. Fig. 538 One dainty herb in temperate Europe and Asia, and native also in the high mountains from Va. to S. Car. Lvs. radical, from an upright rootstock or pip (Fig. 539): fls. white (sometimes pink-tinged), small and tubular, nodding, in a short, radical raceme (Fig. 540), the stamens 6 and style 1 (Fig. 541). Much prized for its delicate, sweet-scented fls. The rhizome and roots are sold in drug stores. They are poisonous in large doses; in small doses used as a heart tonic. The plant is popularly supposed to be the one referred to in the Sermon on the Mount, but this is not to be determined. It is essentially a shade-loving plant. The species is **C. majàlis**, Linn. R.H. 1886:84. Gn. 47, p. 179; 52:1134 and p. 319 (the latter in fruit). A.F. 13:402. Gng 5:56–7. F.R. 2:4. G.C. III. 23:149 (var. *grandiflora*). Lowe, 42 (var. *variegata*).

Lily-of-the-Valley is hardy, and is easily grown in partially shaded places and moderately rich ground. Old beds are liable to run out. The roots and runners become crowded, and few good flower-stems are produced. It is best to replant the beds every few years with vigorous, fresh clumps, which have been grown for the purpose in some out-of-the-way place. Five or 6 strong pips, with their side growths, planted close together, will form a good clump in two years if not allowed to spread too much. The mats of clean foliage make attractive carpets under trees and in other shady places. If the bed is made rich and top-dressed every fall, it may give good results for 4 or 5 years; and plants in such beds thrive in full sunshine. One form has prettily striped foliage, very ornamental in the early part of the season. Lilies-of-the-valley bloom early in spring. They run wild in many old yards, in cemeteries, and along shady roadsides. There are double-fld. forms; also one (var. *prolificans*) with racemes 2 ft. long.



539. Lily-of-the-valley pip.



540. Raceme of Lily-of-the-valley. Natural size.

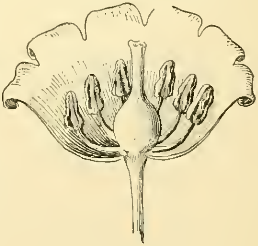
J. B. Keller and L. H. B.

Few cultivated plants give so much satisfaction at so little cost as the Lily-of-the-Valley. It is one of our earliest spring flowers. Its time of blooming is always a subject of note to the household. It succeeds best in partial shade, and may be planted in the wild garden with good effect. It is especially appropriate for planting in irregular patches along the borders of wooded drives. The Lily-of-the-Valley is one of the few flowers we seldom tire of. In and out of season, there is always a demand for its flowers. Hundreds of thousands of crowns are specially grown and matured in France, Germany and Holland for early forcing. They are detached from the clumps, grown separately for two years, sorted before shipment, and known as "pips." Berlin pips are considered best for early forcing. They usually come in bundles of 25, and to have them force evenly it is considered essential to freeze them for a week or two. This may be effected by leaving them in the packing case, moss and all, in some open shed, taking them out as required. They are often placed in ice-houses, and frequently kept in cold storage for summer use. In forcing, no new roots are made. An ordinary propagating bed, with bottom heat, answers the purpose, and sand or sphagnum moss is the plunging medium in most general use. The bundles of crowns are given time to thaw out, the pips separated, and the crowns set in as thickly as possible. The frame is covered to exclude light until growth commences. The crowns are often put at once into a strong bottom heat of 85° F. or thereabouts, but a better way is to start with 50° and gradually increase the temperature. Batches intended for Christmas and New Year's Day often fail because there has not been sufficient preparation for the final high temperature. It is seldom that any leaves appear, even if the flowers come. In such cases, it is customary to put in a few leaf-eyes from the clumps. Later and more carefully prepared batches usually come well and with abundance of leaves, without which the flowers lose half their charm. Bundles of 25 pips are often potted in 6- or 7-inch pots, for Easter sales. As the natural season approaches, less preparation is required. The pots are usually set under greenhouse benches, with a sprinkling of moss over them, away from heating pipes, until some growth is made, and afterwards finished in better light, but not bright sunlight. Clumps are potted and treated in the same way. As there is a large percentage of non-blooming buds in the clumps, they lose in effectiveness. There are rose-colored varieties, double varieties, and varieties with foliage striped with white.

T. D. Hatfield.

Millions of the single crowns, commercially called "pips," are grown on the European continent and exported for forcing. One English firm alone forces during the year upwards of seven millions. We usually receive the pips during the early part of November. They should be unpacked at once, the best pips selected for the earliest forcing, and the smallest kept for the latest forcing. The pips are tied in bundles of 25. If one forces a limited number, say 500 to 1,000 per week, then put the bundles in 8- or 10-inch deep boxes, in any quantity he may choose, place a little soil between the bundles, and give them a good soaking. Then place the boxes in a coldframe or some place where the rains can be kept off—this is important—cover the tops of pips with a few inches of hay or straw. Frost does not hurt the pips in the least, but it is not essential. Never try to force the newly imported pips before New Year's. The cold storage pips are much best for the December crop. In keeping them in cold storage they should be removed from the frames and put into cold storage before there is the slightest movement of growth in the spring. The boxes should be covered with slats, so that one box can be put on another, or charge for storage will be excessive. The temperature should be from 28° to 30° Fahr.

The principal thing in forcing Lily-of-the-Valley is to obtain a strong bottom heat with a cool atmosphere. So, to obtain this, the bed for forcing should have a slate bottom with 6 inches of sand on it and be over some hot water or steam pipes. The temperature of the sand should be 80° to 90° and the atmosphere 50°. As spring approaches less bottom heat will be needed. A copious watering should be given the sand daily, but when the bells are showing color they should not be wet. Keep a covering of boards or cloth over the pips for the first 10



541. Section of flower of Lily-of-the-valley (×4).

days; after that admit the light gradually, and when in full flower give them the full light, but never much sunlight, and avoid draughts. A dozen or 20 pips can be forced the same way in a 5- or 6-inch pot. The flowers should be cut about 24 hours before using, and placed in jars of cold water. This prevents wilting when used.

William Scott.

CONVÓLVULUS (Latin, *convolvo*, to entwine). *Convolvulàceæ.* Includes Calystegia. Bindweed. A genus of about 175 species, widely distributed in temperate and tropical regions. Annual or perennial herbs, sometimes suffrutescent, twining, trailing, erect or ascending, with filiform, creeping rootstocks: lvs. petiolate, entire, toothed or lobed, generally cordate or sagittate: fls. axillary, solitary or loosely cymose, mostly opening only in early morning; corolla campanulate or funnel-form, the limb plaited, 5-angled, 5-lobed or entire. The botanical distinction between Convolvulus and Calystegia is not sufficiently well marked to warrant retaining the latter as a separate genus. When the fls. of *C. occidentalis* are borne singly, the calyx bracts are broad and Calystegia-like; when borne in clusters the bracts are greatly reduced.

S. W. Fletcher.

The species thrive in a variety of soils without especial care. The greenhouse species do best in a soil with considerable fiber. The hardy perennials are usually prop. by dividing the roots, otherwise by cuttings or seeds, the tender species preferably by cuttings. *C. tricolor* is the most important of the hardy annuals. It may also be started in the greenhouse, and makes an excellent plant for the hanging basket. All are vigorous growers, and may become troublesome weeds in some places if not kept within bounds. *C. Japonicus* and *C. Sepium* should be used with caution. This is the chief reason why the hardy perennials are not often found in well-kept gardens, except along wire fences or lattice screens, where the turf is laid up close so as to allow only a narrow border for the roots. The double-flowered form of *C. Japonicus* is seen to best advantage in half-wild places, or on rocky banks, where shrubs make but a stunted growth. Here it will grow luxuriantly, forming graceful festoons from branch to branch, and covering the ground with a pretty mantle of green.

Cult. by J. B. Keller.

A. *Calyx with 2 membranaceous bracts at the base: peduncles usually 1-fld.* (*Calystegia.*)

B. *Stem prostrate, 8 in. to 2 ft. high: peduncle usually shorter than the lvs.*

villòsus, Gray (*Calystègia villòsa*, Kellogg). Plant densely white-villose throughout: stem prostrate, scarcely twining: lvs. slender-petioled, reniform-hastate to sagittate, the upper acuminate, 1 in. or less long, the basal lobes often coarsely toothed: bracts oval or ovate, completely enclosing the calyx: fls. cream-yellow, 1 in. long. Calif. Perennial.

BB. *Stem twining or trailing, 3–10 ft. high: peduncle exceeding the lvs.*

Japónicus, Thunb. (*Calystègia pubéscens*, Lindl.). California Rose. Fig. 542. Hardy perennial, herbaceous twiner: growth very vigorous, often 20 ft.: whole plant more or less densely and minutely pubescent: lvs. hastate, lanceolate, obtuse or broadly acute, with angular or rounded lobes at the base; variable, occasionally without lobes, rarely sharp lanceolate: fls. bright pink, 1–2 in. broad, produced freely during the summer months and remaining expanded for several days. Japan and E. Asia. The double form is now naturalized from southeastern N. Y. to D. C. and Mo. P. M. 13: 243. F. S. 2: 172. B. R. 32: 42.—The double form is completely sterile, with narrow, wavy petals, irregularly arranged, the outer somewhat lacerate. A valuable decorative plant for covering stumps and walls. In rich soil the roots spread rapidly, and will smother out all other plants unless confined in tubs. The *Calystegia pubescens* of Lindley has been wrongly referred to *Ipomœa hederacea*, but the two plants are very different, the former being perennial and the latter annual. See Journ. Hort. Soc. 1:70 (1846). The plant is commonly confounded with *C. Sepium.*

occidentàlis, Gray. Hardy perennial, herbaceous or with suffrutescent base: stem twining, several ft. high, glabrous or minutely pubescent: lvs. from angulate-cordate, with a deep and narrow sinus, to lanceolate-hastate, the posterior lobes often 1–2-toothed: peduncle 1-fld. or proliferously 2–3-fld.: bracts ovate or lanceolate, usually completely enclosing the calyx, variable: corolla white or pinkish, 1–2 in. long; stigmas linear. Dry hills, Calif.—Int. 1881, by Gillett. An admirable plant for rockeries.

542. Convolvulus Japonicus. (×¼.)

Sèpium, Linn. (*Calystègia Sèpium*, R. Br.). Rutland Beauty. Fig. 543. Perennial trailer, 3–10 ft. long, glabrous or minutely pubescent: lvs. round-cordate to deltoid-hastate, the basal lobes divaricate, entire or angulate: fls. white, rose or pink, with white stripes. F.S. 8: 826. B.M. 732. A.G. 12: 638. Gn. 50: 1098.—A very variable species. Cosmopolitan in temperate regions. An insidious weed in moist soil.

AA. *Calyx without bracts: peduncle 1–6-fld.* (*Euconvolvulus.*)

B. *Stem prostrate, trailing, glabrous or minutely pubescent.*

Mauritánicus, Boiss. Strong perennial roots: stem herbaceous, slender, prostrate, rarely branched, minutely villose: lvs. alternate, round-ovate, obtuse, short-petioled: fls. blue to violet-purple, with a lighter throat, 1–2 in. across, very handsome. Africa. B.M. 5243. F.S. 21: 2183. Gn. 39: 788.—A free bloomer through the summer. On dry banks each plant forms a dense tuft which throws up many graceful shoots. Not hardy north of Phila.

Scammònia, Linn. Hardy perennial trailer, deciduous. stem angular, glabrous: lvs. cordate-sagittate, grey-green, the lobes entire or dentate: sepals glabrous, ovate, obtuse; corolla white, creamy or light pink. Asia Minor.—The large tap-roots supply the resinous cathartic drug scammony.

BB. *Stem erect or ascending, silky.*

Cneòrum, Linn. Stem shrubby, half-hardy, 1–4 ft. high: lvs. persistent, lanceolate or spatulate, silky grey: inflorescence a loose panicle, 1–6-fld.: fls. white or tinged with pink, borne freely during the summer. S. Eu.—Valuable as a pot-plant for greenhouse or window decoration, or trained to a warm wall. Confused with *C. oleæfolius.*

oleæfòlius, Desr. Tender perennial: lvs. linear-lanceolate, acute, slightly villose: fls. bright pink, borne freely in loose, umbellate panicles in the summer. Greece. B.M. 289 (as *C. linearis*).—Many plants now passing as *C. oleæfolius* are *C. Cneorum.* The latter may be distinguished by its broader, blunter, silvery-villose lvs. and lighter colored blossoms.

trìcolor, Linn. (*C. mìnor,* Hort.). Fig. 544. Hardy annual: stem trailing, ascending 6–12 in., angulate, densely covered with long brownish hairs: lvs. linear-oblong or subspatulate, obtuse or rounded at the apex, usually pubescent but sometimes glabrous, the margin ciliate towards the base: peduncle 3-fld., exceeding the lvs.: sepals ovate, lanceolate, villose, acute: limb of the corolla azure-blue, throat yellow, margined with white. S. Eu. B.M. 27.—One of the best annuals for the home border. Each plant covers a ground space of 2 ft., and blooms continuously throughout the summer. Flowers remain open all day during pleasant weather. There are many variously striped and spotted forms of this popular annual, none of which surpasses the type in beauty. A variety with pure white fls. is attractive. Other well marked horticultural forms are: Var. **vittàta,** prettily striped with blue and white. F.S. 3:298. R.H. 1848: 121. Var. **compáctus.** Dwarf, and valuable for pot culture. Gt. 47, p. 635. A 5-petaled form is also recorded. F.S. 8: 116.

543. Convolvulus Sepium (×½).

aùreus supérbus, Hort. A tender perennial, but may be treated as an annual, since it flowers the first season from seed: stem trailing or twining, 4–5 ft. long: fls. golden. Valuable as a greenhouse climber and for hanging baskets.—Not sufficiently described for identification.

C. althæoìdes, Linn. (C. Italicus, Roem. & Schult.). Stem prostrate, scarcely twining: upper lvs. pedatifid; lower ovate-cordate, crenate, silvery: fls. pink. May–Aug. Mediterranean region. B.M.359. F.S.10:1021 (as var. argyreus). R.H. 1864:111.—*C. arvènsis,* Linn. Slender perennial trailer, 1–3 ft. long, glabrous or nearly so: lvs. ovate-sagittate or hastate, variable: fls. white or pink. Eu. and E. Asia. Naturalized in old fields through the Atlantic states and Calif. A troublesome weed.—*C. Dahùricus,* Herb. (Calystegia Dahuricus, Fisch.). Hardy deciduous twiner, 3–6 ft.: lvs. oblong-cordate, shortly acute: fls. pink or rose-violet. June, July. N. Eu. B. M. 2609. F. S. 10:1075.—*C. Canariènsis,* Linn. Greenhouse evergreen: lvs. oblong-cordate, acute, villose: fls. violet-purple: peduncle 1–6-fld. Canary Islands. B. M. 1228.—*C. erubéscens,* Sims (C. acaulis, Choisy). Tender biennial: lvs. oblong, hastate, the basal lobes toothed: fls. small, 5-lobed, rose-pink. Australia, B.M. 1067.—*C. macrostègius,* Greene. The plants in the trade under this name may be referred to C. occidentalis.—*C. màjor.* Hort., not Gilib. = Ipomœa purpurea.—*C. ocellàtus,* Hook. Stove evergreen: limb of the corolla white, 5-angled: throat reddish purple: lvs. sessile, linear, acute, 1-veined, villose. S. Afr. B.M. 4065.

S. W. FLETCHER.

544. Convolvulus tricolor. Natural size.

COONTIE of S. Fla. is *Zamia integrifolia.*

COOPÈRIA (after Joseph Cooper, English gardener). *Amaryllidàceæ.* A genus of only two or three species of tender, bulbous plants from Texas, with the habit of Zephyranthes but night-blooming (which is anomalous in the order), and with erect anthers, while those of the latter are versatile. The fls. are fragrant, solitary, 2 in. or more across, waxy-white, tinged red outside, and more or less green within. The lvs. appear with the fls. in summer. They are long, narrow, flat and twisted. The bulbs should be taken up in autumn and stored during the winter in dry soil. Culture easy and like Zephyranthes. Lately a new and little-known plant has been offered by the trade, *C. Oberwetteri,* with "bright green" fls.

A. *Neck of bulb short: perianth tube long.*

Drúmmondii, Herb. EVENING STAR. Bulb roundish, 1 in. thick, with a short neck: lvs. narrowly linear, erect, 1 ft. long: peduncle slender, fragile, hollow ½–1 ft. long: spathe 1½–2 in. long, 2-valved at the tip: perianth tube 3–5 in. long; limb ¾–1 in. long. white, tinged with red outside: segments oblong, cuspidate. Var. **chlorosòlen,** Baker, has a perianth tube stouter and tinged with green: limb longer and less wheel-shaped: lvs. a little broader. B.M. 3482.

AA. *Neck of bulb long: perianth tube short.*

pedunculàta, Herb. Giant Fairy Lily. More robust than *C. Drummondii:* bulb with a longer neck, 2–3 in. long: lvs. about 6, 1 ft. long, ¼ in. broad: peduncle about 1 ft. long: spathe 1–2-valved at the tip: perianth tube shorter, 1½ in. long: limb nearly as long as the tube, tinged red outside. B.M. 3727. R.H. 1853: 401.—The best species. Fls. larger, of purer color, and remaining open a day or two longer. W. M.

COPRÓSMA (Greek name referring to the fetid odor of the plants). *Rubiàceæ.* Shrubs or small trees, often trailing, of New Zealand, Australia and Hawaii. Cult. for their pretty fr. or variegated lvs. Lvs. opposite, mostly small. Fls. small, solitary or fascicled, white or greenish, polygamous diœcious; corolla-limb 4–6-lobed, the lobes revolute; stamens 4–6: fr. an ovoid or globose drupe. Coprosmas are greenhouse plants in the north, but they are rarely cult. In S. Calif. 2 species are cult. in the open. Prop. by hardened cuttings. The soil which is found among Kalmia roots, mixed with good loam and sand, if necessary, will suit these plants. Cuttings should be rooted in moderate heat in spring, before growth commences. If placed under a handlight or propagating frame, care must be taken to prevent damping, to which the cuttings are liable.

Baùeri, Endl. (*C. Baueriàna*, Hook. f. *C. Stóckii*, Hort.). Trailing plant, with oval-obtuse or rounded entire lvs., which are oddly blotched with yellow and whitish or even almost wholly yellow. New Zealand.—With age it forms a compact shrub. Vars. **picturàta**, Hort., and **variegàta**, Hort., are the common forms.

aceròsa, A. Cunn. Low and spreading, with minute lvs., small white fls., and pretty sky-blue drupes or berries. New Zealand. G. W. Oliver and L. H. B.

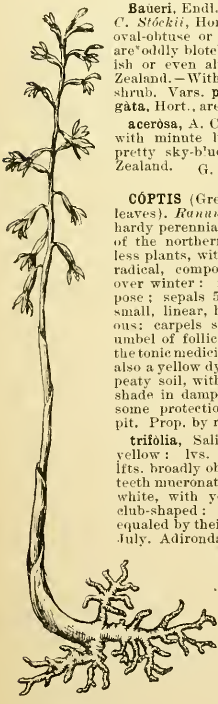
CÓPTIS (Greek, *to cut*, from the cut leaves). *Ranunculàceæ.* Eight species of hardy perennial herbs of the cooler parts of the northern hemisphere. Low, stemless plants, with slender rootstocks: lvs. radical, compound or divided, lasting over winter: fls. white or yellow, scapose; sepals 5–7, petal-like; petals 5–6, small, linear, hood-like; stamens numerous: carpels stalked, few, becoming an umbel of follicles. The bitter roots yield the tonic medicine known as "gold thread;" also a yellow dye. The plants should have peaty soil, with a little sand, and prefer shade in damp situations. They require some protection in winter, as in a cold pit. Prop. by root division and seed.

trifòlia, Salisb. No stem: rootstock yellow: lvs. compound, long-petioled; lfts. broadly obovate, cuneate, obtuse, the teeth mucronate: fl.-stem slender; sepals white, with yellow base; petals small, club-shaped: follicles 3–7, spreading, equaled by their stalk; seeds black. May–July. Adirondacks and westward. L.B.C. 2:173.—Neat and pretty, with shining lvs. K. C. Davis.

CORAL BERRY. *Symphoricarpus vulgaris.*

CORAL DROPS. *Bessera elegans.*

CORALLORHÌZA (Greek for *coral-root*). *Orchidàceæ*, tribe *Epidéndreæ.* Coral Root. Low native orchids, growing in woods and parasitic on roots, destitute of green foliage, the plant usually brownish or yellowish and inconspicuous. Fls. small, somewhat 2-lipped, usually obscurely spurred at the base; sepals and petals nearly alike; lip small, slightly adherent to the base of the column; pollinia 4. Species few, in N. Amer., Eu. and Asia. The Coral-roots have little merit as garden plants, although very interesting to the student. They may be grown in rich, shady borders. Two species have been offered by dealers in native plants. **C. multiflòra**, Nutt. (Fig. 545), is purplish, 1½ ft. or less high, 10–30-fld., lip deeply 3-lobed: grows in dry woods in northern states; **C. Mertensiàna**, Bong., scape many fld., 8–15 in. high, the lip entire and broadly oblong: occurs in Brit. Col. and N. to Alaska. L. H. B.



545. Corallorhiza multiflora. (× ⅓.)

CORAL-ROOT. *Corallorhiza.*

CORAL-TREE. *Erythrina.*

CÓRCHORUS Japònicus. See *Kerria.* The genus contains the two plants that furnish Jute, *C. capsularis* (which yields most) and *C. olitorius.* They are annual plants, natives of Asia but cultivated throughout the tropics, growing 10 or 12 ft. high, with a straight stem as thick as the little finger and branched only at the top. The young shoots of both are used as pot herbs. *C. olitorius* is much grown for this purpose in Egypt, and is known as Jews' Mallow. They belong to the *Tiliàceæ.*

CÓRDIA (an early German botanist, Valerius Cordus). *Borraginàceæ.* Warm-climate trees or shrubs, mostly American. Calyx tubular or campanulate, toothed or lobed: corolla tubular, lobed, the parts and the stamens 4 or more: style 2-lobed: fr. a drupe which is 4-loculed and usually 4-seeded: lvs. entire or toothed. The Cordias are greenhouse plants with showy fls., of easy cult. Grown in the open in the extreme S. Prop. by cuttings of firm wood and by seeds.

Sebestèna, Linn. (*C. speciòsa*, Willd.). Geiger Tree. Tall shrub or small tree, hairy, with rough, broad-ovate, large-stalked lvs.: fls. 1–2 in. long, scarlet, stalked, in large, open, terminal clusters, the crumpled corolla-lobes and stamens 5–12: drupe enclosed in the hazel-like husk formed by the persistent calyx. Keys of Fla. and S. B.M. 794.

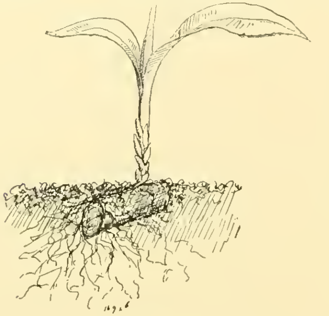
Fráncisi, Tenore. Tall: lvs. dark green: fls. white. S. Amer.

Other Cordias, of which there are many, are likely to come into cult. in the southern country. *C. Gréggii*, Torr., var. *Pálmeri*, Wats. (G.F. 2:233), of Mexico, "in the size and beauty of its fls. equals the C. Sebestena."—*C. Myxa*, Linn., from trop. Asia and Austral., is one of the best woods for kindling fire by friction, and is useful in many other ways. L. H. B.

CORDYLÌNE (*club-like:* referring to the fleshy roots). *Liliàceæ.* Dracæna. A genus of greenhouse plants closely related to Dracæna, but the ovary contains several ovules in each cell, and the solitary pedicels are provided with a 3-bracted involucre: stem tall, often woody, bearing large, crowded lvs., to the striking variegation of which the group owes its value: fls. panicled; stamens 6: pedicels articulated: perianth 6-parted: ovary 3-celled: fr. a berry. Cultivated for the ornamental foliage. The horticultural forms and names have become very numerous. The various species are in the trade under Dracæna, which see for a key to the species of both genera combined. In the following paragraphs, the initial D indicates that the plant in question is known in the trade as a Dracæna, and C that it is known as a Cordyline (see *Dracæna*). For a monograph, see Baker, Journ. Linn. Soc. 14: 538 (1875). K. M. Wiegand.

Of Cordylines or Dracæna, propagation is generally effected by cutting the ripened stems or trunks, from which all lvs. have been removed, into pieces from 2–4 in. long. These are laid either in very light soil or in sand in the propagating bed, where they receive a bottom heat of about 80°, being barely covered with sand or moss (Fig. 546). The eyes soon start into growth, and, as soon as they have attained a height of 3–4 in., are cut off with a small heel and again placed in the propagating bed until rooted, after which they are potted off into small pots in light soil, kept close until they become established. They are then shifted on into larger pots as soon as well rooted. They delight in a mixture of 3 parts good, turfy loam and 1 part well-decayed cow-manure, with a liberal sprinkling of sharp sand. A warm, moist atmosphere suits them best while growing, but towards fall the finished plants must be gradually exposed to full sunshine and a dry atmosphere, which develops their high colors.

The kinds enumerated below are such as are mainly grown in large quantities for decorative purposes, and are sold principally during the winter months, especially during the holiday season, when plants with bright colored foliage are always in strong demand: *Cordyline amabilis.*—A strong-growing species with broad green foliage, which is prettily variegated with white and deep rose. One of the hardiest varieties, either for decorations in winter or for outdoor work, vases, etc., in summer. *C. imperialis.*—Another strong-growing species, with deep olive-green foliage, which changes to deep rose with white edge. *D. fragrans.*—An African species with broad, massive, deep green foliage which makes noble decorative plants, being frequently grown into specimens from 6–8 ft. high. Its foliage is of heavy texture, making it a useful plant for the dry atmosphere of a living-room. Two handsomely variegated forms of the above are *D. Lindeni* and *D. Massangeana*, both very desirable varieties. *C. terminalis.*—This is the most popular variety, and is grown in immense quantities. The foliage on well-matured plants is of an intense rich crimson marked with lighter shadings. *C. australis* (commonly called *C. indivisa*).—Used principally as an outdoor decorative plant in summer, but extensively used for furnishing vases, window-boxes, etc. It succeeds best when planted out in the open border during summer, potted in the fall and stored during winter in a cool greenhouse. It is propagated almost exclusively from seed, which germinates freely if sown during the early spring months in sandy soil, in a temperature of 60 to 65°, growing them on during the first season in small pots. These, if planted in the open border the second season, make fine plants for 6- or 7-inch pots. There are a number of varieties of Indivisa, among them several handsomely variegated forms, which, however, are but little distributed yet.


546. Stem-cutting of Cordyline.

Among the principal varieties and species besides the above which are grown to some extent in a commercial way are: Baptistii, Cooperi, Porphyrophylla, Shepherdi, Stricta grandis, Youngi, Goldieana, Congesta, Bruanti, Marginata and Lord Wolseley, the latter a most beautiful, graceful, high-colored variety, undoubtedly the most distinct and useful commercial sort yet introduced and which, as soon as it becomes more plentiful, is certain to be very popular. J. D. Eisele.

Cordyline australis and its allied forms are easily raised from seed, which is readily obtainable in a fresh state. The seed should be sown rather thinly in a light, sandy soil, and, as there is little danger of the seedlings damping off, they may be allowed to grow in the receptacles in which they are sown until large enough to go into 3-in. pots. If sown early in spring, the plants will be large enough for 6-in. pots by the end of the following September.

Dracæna Knerckii, C. cannæfolia, D. Lindenii and *D. Massangeana* are among the best decorative plants for the dwelling house. *D. Knerckii* and the two variegated forms of *D. fragrans* are rooted from cuttings taken from headed-back plants. In propagating *C. cannæfolia*, when seed cannot be obtained, old plants should be mossed so as to produce roots before the top is taken off, as it is a shy-rooting species from cuttings. *D. Goldieana* should be topped and rooted in a good bottom heat, and the stems cut into pieces small enough to be put in pots when the shoot is of sufficient length, instead of cutting off the shoots and rooting afresh. *D. Godseffiana* and *D. maculata* evidently belong to the same section; every little branch of these will root in sharp sand. Long stems of *D. ensifolia* and *D. Barkerii*, when cut in sections of from 4 to 6 in., with the leaves kept on, will root quickly and may be used as stock plants. *C. Brasiliensis*, an elegant species with broad green lvs., is best propagated by adopting the method practiced on the colored-lvd. kinds, of which *C. terminalis* is perhaps the best known. This method consists of cutting up the stems into small pieces and placing them in sand, with a brisk bottom heat. Small shoots are developed in a short time, which will frequently be found to have small roots at their bases, but they are of little use for the subsequent nutriment of the plantlet. The shoot, when large enough, should be separated from the piece of stem and inserted in the sand-bed, where it will develop thick feeding roots. Afterwards they are potted and kept in a warm, moist atmosphere. Cuttings may be put in at any time when bottom heat is at command. The soil used should be light and enriched with rotted cow-manure.

G. W. Oliver.

A. *Foliage of sessile, thick, sword-shaped lvs.*

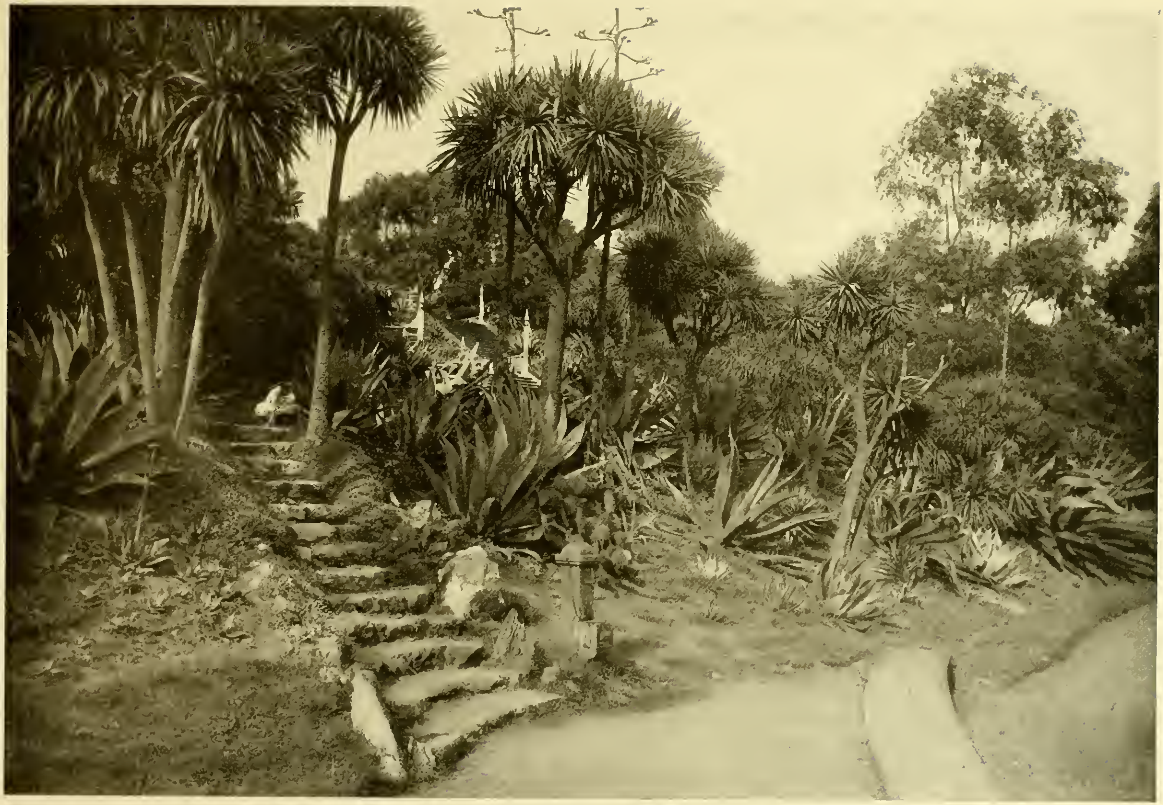
B. *Lvs. glaucous beneath, broad.*

indivisa, Kunth. Arborescent, 10–20 ft. high: lvs. dark green, densely crowded, 2–4 ft. long, 4–5 in. broad at the middle, 1½–2 in. at the base, rigid, coriaceous; midrib stout, colored red and white, veins on each side of it 40–50: panicle nodding: pedicels .5–1 line long; bracteoles lanceolate, 3–4 lines long, membranous; perianth 3–4 lines long, white; tube very short, campanulate; segments equal, spreading: ovules 5–6 in each cell. New Zealand. Gn. 49,p.86. Lowe, 52.—Coolhouse; valuable for vases. Rare in cult.

547. Cordyline australis—C. indivisa of the trade.

BB. *Lvs. green on both sides, narrower.*

stricta, Endl. (*D. congésta*, Hort.). Slender, 6–12 ft. high: lvs. less crowded than in the next, acuminate, 1–2 ft.



Trees of Cordyline australis, and desert plants, planted in Golden Gate Park, San Francisco

long, 9–15 lines wide, base 3–6 lines wide, scarcely costate; veins scarcely oblique, margins obscurely dentate: panicle terminal and lateral, erect or cernuous: pedicels .5–1 line long; lower bracteoles lanceolate; perianth lilac, 3–4 lines long, campanulate, interior segments longer than the outer: ovules 6–10 in each cell. Australia. B.M. 2575. G.C. III. 17:207 (*D. congesta*).—Coolhouse; vases, etc. Var. **grándis,** Hort. Large, highly colored. Var. **díscolor,** Hort. Like var. *grandis*, but with foliage dark bronzy purple.

austràlis, Hook. (*D. indivìsa*, Hort. *D. calocòma*, Wend.). Fig. 547. Arborescent, 20–30 ft. high: lvs. densely rosulate, 3–4 ft. long, 12–18 lines wide; base 6–9 lines wide, acuminate, green; midrib firm, prominent, nerves on each side of it 12–20, scarcely oblique: panicle erect, terminal, ample: pedicels very short; bracteoles deltoid, .5 line long; perianth white, 3–4 lines long; tube short, campanulate, segments nearly equal, spreading: mature seeds often solitary. New Zealand. B.M. 5636. G.C. III. 23:153. Gn. 47, p. 312; 48, p. 197. I.H. 35:40 (var. *Doucetiàna*); 37:114 (var. *Dalleriàna*); 40:190 (*lineàta*, var. *purpuráscens*). S.M. 1, p. 487, f. 189.—Coolhouse: vases, etc. Var. **aùrea-striàta,** Hort. Variegated with a number of longitudinal yellow stripes. Var. **atropurpùrea,** Hort. Base of leaf and under side of midrib purple. Var. **lineàta,** Hort. Lvs. broader, the sheathing base stained with purple. Var. **Veìtchii,** Hort. (*D. Veìtchii*, Hort.). Base of leaf and under side of midrib bright crimson. **C. Hoòkeri,** Hort., is a garden form.

AA. *Foliage of petioled lvs.*

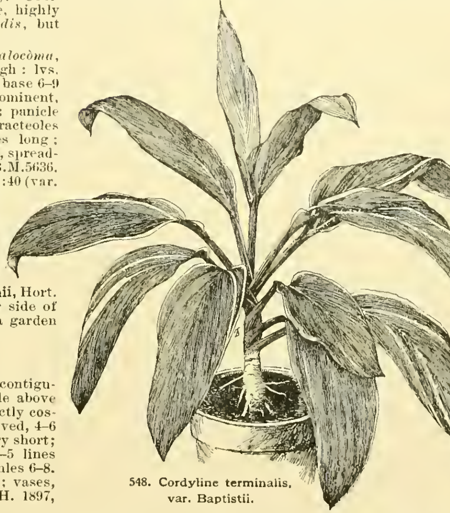
B. *Lvs. oblanceolate; petioles broad.*

rùbra, Hugel. Slender, 10–15 ft. high: lvs. contiguous, ascending, 12–15 in. long, 18–21 lines wide above the middle, thick, dull green both sides, distinctly costate; veins oblique; petiole broad, deeply grooved, 4–6 in. long: panicle lateral, nodding: pedicels very short; bracteoles small, deltoid; perianth lilac, 4.5–5 lines long, inner segments longer than the outer: ovules 6–8. Country unknown. G.C. III. 22:285.—Coolhouse; vases, etc. **D. Bruánti,** Hort., is a garden form. R.H. 1897, pp. 514, 515. G.C. III. 22:285.

BB. *Lvs. lanceolate; petioles narrow, nearly terete.*

Haageàna, Koch (*C. Múrchisoniæ*, F. Muell.). Slender and small: lvs. contiguous, ascending, oblong-falcate, 4–8 in. long, 2–2½ in. wide at the middle, acute, base rounded or deltoid, thick, dull green throughout, distinctly costate; veins slender, oblique; petiole 3–4 in. long, deeply channelled: panicle lateral: pedicels 1.5–2 lines long; perianth 4–4.5 lines long, tinged with lilac; segments spreading: ovules 6–8 in each cell: berry with a dry pericarp. Australia.

terminàlis, Kunth (*C. cannæfòlia*, F. Muell.). Low and slender, stem 3–6 lines thick: lvs. contiguous, ascending, green or rarely colored, 12–18 in. long, 2–3½ in. wide, acute, thickish, distinctly costate; veins frequently unequal, strongly oblique; petiole 4–6 in. long, deeply channelled: pedicels very short or none; bracteoles deltoid, membranous; perianth 5–6 lines long, white, lilac or reddish, segments short: ovules 6–10: berry large, red. East Indies. A.G. 16:361. B.R. 21:1749.—The varieties in cultivation are almost innumerable. Those in the American trade are the following (all stove plants), usually considered as horticultural species: **amábilis.** Lvs. broad, shining deep green, in age becoming spotted and suffused with rose and white. **Amboyénsis.** Lvs. oblong-lanceolate, recurved, deep bronze-green edged with rose-carmine below; petioles tinged with purple. **Anerliénsis.** Lvs. very broad, deep bronze-red, with some white. **Báptistii.** Fig. 548. Lvs. broad, recurved, deep green, with some pink and yellow stripes; stem also variegated. I.H. 26:334. **Baùsei.** Lvs. broad, dark green, with some white. **bélla.** Lvs. small, purplish marked with red. **Brasiliénsis,** Schult. Lvs. broad. **Cántrelli.** Lvs. dark metallic crimson, young ones bright carmine. **Coòperi.** Lvs. deep wine-red, gracefully recurved: common in cult. **férrea,** Baker. Lvs. narrow and somewhat oblanceolate, 5–7, bright or dark crimson; petiole short. Lowe 3 (var. *versicolor*); 29. B.M. 2053. L.B.C. 13:1224. **Fràseri.** Lvs. somewhat erect, broad, oblong, abruptly acute, blackish purple with bloom, margin below with a deep rosy lake stripe extending down the petiole. **Gládstonei.** Lvs. broad, brilliant crimson. **Guilfoylei.** Lvs. long and narrow, tapering both ways, recurved, striped with red, pink or white, white on lower part of leaf and margin of petiole. I.H. 19, p. 249. **hỳbrida.** Lvs. broad, variegated, deep green margined with rose, in age deep rose, creamy white in young lvs. **imperiàlis.** Lvs. arching or erect, oblong, thick, deep metallic green, rayed all over with bright crimson or pink, handsome. **Jardiniere** (*terminalis alba* × *Guilfoylei*). Lvs. very small and compact, narrow, green broadly margined with white. **metállica.** Lvs. erect-arching, oblong, when young uniform rich coppery purple, in age dark purple-bronze; petioles same. F.M. 1872:24. **nigro-rùbra.** Lvs. narrow, linear-lanceolate, dark brown with rosy crimson centers, young often entirely rose. **Norwoodiénsis.** Lvs. striped with yellow, green and crimson, last color principally confined to the margin; petioles brilliant. **Regìna.** A broad-lvd. form. **Robinsoniàna.** Lvs. long, lanceolate-acuminate, arched, light green, striped with bronze-green and brownish crimson. I.H. 26:342. **Schùldii.** Lvs. broad, variegated. F.E. 7:961. **Scóttii.** Lvs. broad, arching, deep green, crimson edged; said to be a hybrid. **Yoùngii.** Lvs. broad, spreading, when young bright green streaked with deep red and tinged with rose, in age bright bronze. **Yoùngii,** var. **ròsea,** Hort. Green, tinged with pink, white or carmine. **Yoùngii,** var. **álba,** Hort. Variegated with white instead of red. Crosses with Scottii are known as Stricta, Albo-lineata, Mrs. George Pullman, Mrs. Terry; with Norwoodiensis, as Little Gem.



548. Cordyline terminalis, var. Baptistii.

List of synonyms, unidentified trade names and others: *C. angústa*, Hort. (C. terminalis var.). Lvs. narrow, arching, dull dark green above, purplish beneath. A slender form.—*C. angustifòlia*, Kunth = C. stricta.—*C. aurantìaca*, Hort. = ?—*C. Balmoreàna*, Hort. Lvs. bronzy, with white and pinkish stripes.—*C. Bánksii*, Hook. Lvs. very long, linear-lanceolate, 3–5 ft. long, 2–3 in. wide, petioled, green, glaucous beneath; veins conspicuous. G.C. III. 18:613.—*C. Berhéleyi*, Hort. = ?—*C. Cassanòvæ*, Hort. = ?—*C. Chélsoni*, Hort. (form of C. terminalis). Lvs. large, glossy dark green, almost black, becoming suffused and edged with crimson. I.H. 19, p. 90.—*C. compácta*, Hort. (C. terminalis form). Lvs. recurved, broad, dull green, with bronze and rose stripes in age.—*C. Dénnisoni*, Hort. (C. terminalis form). Dwarf: lvs. broad, bronzy purple.

—*C. Elizabethiæ*, Hort.=?—*C. Eschscholtziàna*, Mart.=C. terminalis.—*C. excèlsa*, Hort. (C. terminalis form). Lvs. broad, arching, bronzy, margined with crimson.—*C. Frederìca* =?—*C. frutéscens* = ?—*C. gloriòsa*, Hort. (C. terminalis form). Lvs. very large and broad green, with a peculiar bronze-orange hue.—*C. helychioìdes*, F. Muell.=C. terminalis.—*C. heliconiæfòlia*, Ott. et Diet.=C. terminalis.—*C. Hèndersoni*, Hort.=?—*C. magnífica*, Hort. (C. terminalis form). Lvs. large and broad, bronzy pink, becoming darker.—*C. Manners-Súttoniæ*, F. Muell.=C. terminalis.—*C. porphyrophýlla*, Hort. (C. terminalis form). Lvs. deep bronzy purple, glaucous beneath.=*C. Rèx*, Hort. (C. terminalis form). Lvs. medium width, bronzy green, flushed purple and streaked with carmine.—*C. rosàcea*, Hort. (C. terminalis form). Lvs. recurved, broad, dark bronzy green margined with pink.—*C. Salmònea*=?—*C. sepiària*, Seem=C. terminalis.—*C. Sièberi*, Kunth =C. terminalis.—*C. spléndens*, Hort. (C. terminalis form). Lvs. dense, short, ovate-acute, bronzy green, shaded with rose-carmine.—*C. Zeelándica*, Hort.=C. rubra.

K. M. Wiegand.

COREÓPSIS (Greek, signifying *bug-like*, from the fruit). *Compósitæ*. Tickseed. Annual or perennial herbs, flowering in summer and autumn. Nearly all natives of eastern N. Amer. Lvs. either opposite or alternate: heads pedunculate and radiate; the broad involucre with bracts of two kinds, the outer narrower and greener, receptacle chaffy; rays very showy, yellow particolored or rarely rose, neutral: disk fls. yellow, brown or dark. The genus differs from Bidens only in the broad, flat and winged akenes, with short or obsolete pappus. Many of the species are in the trade under the name Calliopsis. All the kinds are of easiest culture. The perennials are hardy border plants. The annuals are raised in any garden soil, and bloom freely with little care. They are all showy plants.

549. Coreopsis tinctoria—Calliopsis elegans of gardens (× ½).

Index: angustifolia, 2; aristosa, 16; aurea, 17; auriculata, 6; bicolor, 4; cardaminefolia, 3; coronata, 8; delphinifolia, 13; Drummondii, 5; elegans, 4; grandiflora, 9; lanceolata, 7; major, 10; marmorata, 4; palmata, 12; pubescens, 6; rosea, 1; tinctoria, 4; trichosperma, 15; tripteris, 11; verticillata, 14.

A. *Disk yellow: rays rose-purple.*

1. **ròsea**, Nutt. Perennial: diffusely branched from slender, creeping rootstocks 1–2 ft. high, smooth: lvs. opposite and small (1–1.5 in. long), all narrowly linear-entire or rarely toothed or lobed: heads small, ⅔ in. broad or less, short-peduncled; rays wedge-shaped, lobed at the apex: akene oblong, wingless; pappus an obscure border. Southeastern U. S.

AA. *Disk and involucre dark purple: rays yellow or parti-colored, wedge-shaped and lobed.*

B. *Outer involucral bracts very short, triangular.*

2. **angustifòlia**, Ait. Perennial: strict and tall, 1–3 ft. high, glabrous, sparsely branched at the summit: lvs. alternate, entire, thickish, basal few or wanting, lower cauline elliptical on long petioles, upper narrowly spatulate, sessile or reduced to bracts: heads 1–1.5 in. broad; rays entirely yellow: akene with lacerate wings and setiform awns. Southern U. S.

3. **cardaminefòlia**, Torr. & Gray. Annual: low and diffusely much branched from the base, 6–18 in. high, glabrous: basal lvs. numerous-petioled, pinnatifid, divisions narrowly elliptical, becoming linear in the upper lvs.: heads as in the next but smaller, and often entirely dark: akenes winged, smooth; pappus none. Southern U. S.

4. **tinctòria**, Nutt. (*C. bícolor*, Reich. *C. élegans*, Hort. *Callióps is marmoràta*, Hort.). Fig. 549. Annual: stem strict, 1–3 ft. high, branched only at the summit, glabrous: basal lvs. wanting, cauline opposite, sessile, pinnatifid, divisions all long and narrowly linear: heads ¾–1¼in. broad, small; rays with dark purple base: akenes oblong, wingless, smooth. Cent. U. S. B.M. 2512. B.R. 10:846. Mn. 1:85.—A common garden annual; showy and good. Var. **nàna**, Hort. Dwarf, low and compact. Tom Thumb varieties.

Var. **atropurpùrea**, Hook. (*C. nìgra*, Hort.). Rays almost entirely dark. B.M. 3511.

BB. *Outer involucral bracts narrowly linear, equalling the inner.*

5. **Drùmmondii**, Torr. & Gray (*C. diversifòlia*, Hook. *C. pícta*, Hort.). Golden Wave. Annual: stem strict, branched above, 10–18 in. high, sparsely hirsute below: basal lvs. wanting, cauline petioled, pinnatifid, divisions short, broadly elliptical, those of the upper lvs. linear: heads 1–2 in. broad, large; rays usually dark at the base: akene oval, thick, wingless, smooth; pappus none. Tex. B.M. 3474. S.B.F.G. II. 4:315.

AAA. *Disk yellow or brown: rays entirely yellow (except rarely No. 8).*

B. *Rays wedge-shaped, lobed at the apex: peduncles 6–16 in. long, naked.*

C. *Lvs. all entire or with a few basal lobes: large.*

6. **pubéscens**, Ell. (*C. auriculàta*, Schk. and Hort.). Perennial: tall, 1–4 ft. high, branched above, pubescent or nearly glabrous, more leafy than the following species: lvs. thickish, basal wanting, obovate-oval to oblong-lanceolate, very acute, petioled or nearly sessile, entire or with small, acute, lateral lobes; outer involucral bracts lanceolate, nearly as long as the inner: akenes similar to those of the next species. Southern U. S.

7. **lanceolàta**, Linn. Fig. 550. Perennial: low, 1–2 ft. high, sparingly branched, glabrous or nearly so: lvs. few, opposite, mostly near the base, oblong-spatulate to linear, petioled, mostly obtuse, entire (rarely with a few lateral lobes): heads 1.5–2.5 in. broad; peduncles very long, outer involucre equaling the inner: akenes orbicular, papillose, broadly winged; pappus minute or obsolete. Eastern U. S.—Used extensively for cut fls.

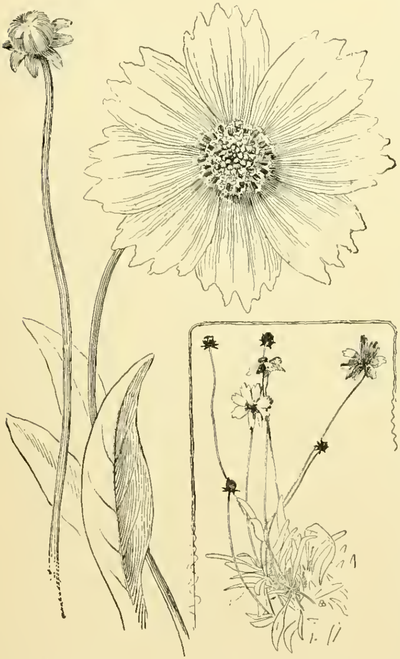
Var. **angustifòlia**, Torr. & Gray. Low: stems scapiform: lvs. narrow and crowded, 2–4 lines wide.

Var. **villòsa**, Michx. Lvs. spatulate-obovate to oblong, villous, as is also the stem, with jointed hairs.

CC. *Lvs. mostly pinnatifid, small.*

8. **coronàta**, Hook. Annual: low and often weak, 12–18 in. high, much branched from the base, sparsely hirsute: lvs. opposite, basal numerous petioled, pinnatifid, divisions ovate, lateral much smaller; cauline few, re-

duced, spatulate, often entire : heads 1.5–2 in. broad; rays often with a few dark spots above the orange base; outer involucre ½ shorter than the inner : akene orbicular, broadly winged; pappus very minute. Tex. B.M. 3460. S.H. 1:270.



550. Coreopsis lanceolata. Single flower natural size.

9. **grandiflòra**, Nutt. (*C. lóngipes*, Hook.). Perennial: simple or few-fld., glabrous, 1–2 ft. high: lvs. opposite, basal wanting, lower cauline spatulate or lanceolate, entire, upper divided into several linear entire divisions : heads 1–2.5 in. broad: akene orbicular, papillose, broadly winged ; pappus paleaceous. Southern U. S. Sweet, B.F.G. 175. B.M. 3586. Gn. 47:995. Mn. 5:201.

BB. *Rays elliptical, entire or nearly so.*

C. *Leaf divisions entire.*

D. *Divisions lanceolate, large.*

10. **màjor**, Walt. (*C. senifòlia*, Michx.). Perennial : tall and stout, 2–3 ft. high, pubescent, much branched above : lvs. opposite, basal wanting, lower cauline small, upper sessile, 2–3 in. long, palmately 3-divided, divisions equal, broadly lanceolate, acute : heads 1¼–2 in. broad : akenes obovate-elliptical, winged, summit 2-toothed. Southeastern U. S.

Var. **Œmleri**, Britton. Smooth, leaf-divisions more attenuate at the base. B.M. 3484 as *C. senifolia*.

Var. **lineàris**, Small. Smooth : leaf-divisions narrow, 2–4 lines wide.

11. **trípteris**, Linn. Perennial : very large and stout, 4–8 ft. high, branched above, glabrous : lvs. opposite, petioled, 4–6 in. long, pinnatifid, divisions broadly or narrowly lanceolate : heads medium, pale : akene oblong, narrowly winged; pappus wanting. Cent. U. S.

DD. *Divisions broadly linear to filiform.*

12. **palmàta**, Nutt. (*C. prǽcox*, Fres.). Perennial : tall and stout, 1½–3 ft. high, sparingly branched at the summit : lvs. opposite, thick, cuneate, 2.5 in. long, 3-cleft to the middle, divisions broadly linear, midrib 3-nerved below: heads 1½–2½ in. broad : akenes oblong, narrowly winged ; pappus minute or obsolete. Cent. U. S. R.H. 1845:265.

13. **delphinifòlia**, Lam. Perennial: glabrous, branched above, 1–3 ft. high : lvs. opposite, sessile, 2–3 in. long, the basal wanting, pinnatifid, divisions 3–7, broadly linear ; disk dark brown : akene obovate, narrowly winged; pappus teeth short. Southeastern U. S.

14. **verticillàta**, Linn. (*C. tenuifòlia*, Ehrh.). Perennial: sparingly branched, 1–3 ft. high: basal lvs. wanting, cauline opposite, sessile, 1–2-ternately divided, divisions linear-filiform : heads 1–1½ in. broad : akenes obovate-wedge-shaped, narrowly winged; pappus nearly obsolete. Eastern U. S.

CC. *Leaf-divisions coarsely serrate or incised.*

15. **trichospérma**, Michx. Annual : tall, 2–5 ft. high, branched near the summit, glabrous: lvs. 2–4 in. long, the lower wanting, pinnatifid, on very short petioles, divisions narrowly lanceolate, acute, serrate or incised; rays pale : akene 4 lines long, cuneate, flat, wingless, ciliate and hairy; awns 2, very short. Eastern U. S.

Var. **tenuíloba**, Gray. Leaf-segments linear.

16. **aristòsa**, Michx. Annual : like the last, but lvs. slightly pubescent beneath : akenes broader, with slender awns as long as the body. Cent. U. S. B.M. 6462. R.H. 1869:72.

17. **aùrea**, Ait. Annual : glabrous, 1–3 ft. high: lvs. pinnatifid, the upper sometimes simple; divisions from lanceolate to linear, sparingly incised; outer involucral bracts narrowly linear, inner black-punctate : akenes broadly cuneate, very small (1–2 lines long), nearly glabrous; pappus of two blunt, chaffy, very short teeth. Southeastern U. S.—Very variable.

C. aristòsa, Michx., *C. involucràta*, Nutt., and *C. trichospérma*, Michx., are now usually placed under Bidens.—*C. Atkinsoniàna*, Dougl., differs from C. tinctoria in its larger size and winged akenes. Annual. Western U. S.—*C. auriculàta*, Linn. Perennial : low, stoloniferous, hirsute: lvs. petioled, short, oval, mostly entire: heads large, very long, peduncled: probably not in the trade. Southern U. S.—*C. involucràta*, Nutt. Annual : like C. aristosa, but heads larger, involucral bracts more numerous, awns shorter. Cent. U. S.—*C. Lèavenworthii*, Torr. & Gray. Annual: leaf-divisions linear-spatulate: rays cuneate, lobed, yellow: awns 2, slender: akene winged. Southern U. S.—*C. nudàta*, Nutt. Perennial : rush-like, lvs. mostly basal, long, filiform ; rays rose-colored: wing of akene pectinate. Southern U. S.

C. argùta, Pursh=C. aurea, Ait.—*C. atropurpùrea*, Hort.=Thelesperma, sp.—*C. Boykiniàna*, Nutt.=C. grandiflora.—*C. dichótoma*, Michx.=C. angustifolia.—*C. diversifòlia*, DC.=C. auriculata.—*C. linifòlia*, Nutt.=C. angustifolia.—*C. marmoràta*, Hort.=C. tinctoria.—*C. oblongifòlia*, Nutt.=C. lanceolata.

K. M. WIEGAND.

CORIANDER is the seed-like fruit of *Coriandrum sativum*, Linn., an umbelliferous annual of S. Europe. The plant grows 2–3 ft. high, glabrous, strong-smelling, with lvs. divided into almost thread-like divisions, and small-white fls. The plant is easily grown in garden soil. It occasionally becomes spontaneous about old yards. The seeds (or fruits) are used as seasoning and flavoring in pastries, confections and liquors, although they are less known in this country than caraway. The plant is occasionally cultivated in Amer. gardens along with sweet herbs.

CORIANDRUM. See *Coriander.*

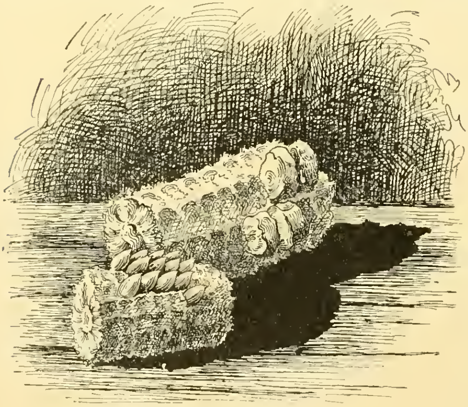
CORIÀRIA (*corium*, skin, leather ; as *frutex coriarius*, a shrub used for tanning leather, was described by Pliny). *Coriariàceæ.* Shrubs or perennial herbs : lvs. deciduous, entire, 3–9-nerved, opposite and distichous : fls. polygamous-monœcious in slender racemes, small; petals and sepals 5; stamens 10: fr. berry-like, consisting of 5 1-seeded nutlets enclosed by the enlarged and colored petals. About 8 species in Himal. and E. Asia, Mediterranean region, N. Zealand and S. Amer. Ornamental shrubs or herbs, with slender, arching branches imitating pinnate lvs., and with very showy yellow, red or black fr. The lvs. of some species are used for tanning leather; the frs. are poisonous. *C. Japónica* has proved hardy with slight protection in Massachusetts, and *C. terminalis* seems to be of the same hardiness; the other species are more tender. They grow in almost any good garden soil, and prefer sunny position. Prop. readily by seeds and greenwood cuttings in summer under glass; also by suckers and layers.

Japónica, Gray. Shrub, 2–3, sometimes to 10 ft.: branches quadrangular: lvs. nearly sessile, ovate or ovate-lanceolate, 3 nerved, smooth, 2–4 in. long: fls. in axillary racemes from the branches of last year: fr. becoming bright red in summer, changing to violet-black when ripe. Jap. B.M. 7509. G.F. 10:343.

terminàlis, Hemsl. Herbaceous or suffruticose, 2–3 ft.: branches quadrangular: lvs. nearly sessile, broad-ovate to ovate-lanceolate, 5–9-nerved, scabrous on the veins beneath, 1–3 in.: fls. in terminal racemes on shoots of the current year: fr. bright yellow. Sikkim, China.—A very ornamental plant, keeping its yellow fr. from July until late in fall; being herbaceous, it is easier to protect from frost than the former. Recently introduced into cult. as *C. Nepalensis.*

C. myrtifòlia, Linn. Shrub, 4–10 ft.: lvs. 3-nerved, glabrous: fls. greenish, from the old wood: fr. black, poisonous. Mediterranean region. Yields a black dye.—*C. Nepalénsis*, Wall. Shrub, 8–10 ft.: lvs. 3–5-nerved, glabrous: fls. brownish: fr. black. Himal.—*C. sarmentòsa*, Forst. Suffruticose, procumbent: racemes axillary, on young branches. B.M. 2470. The Wineberry shrub of the natives. The berries yield a pleasant drink, but the seeds are poisonous.

ALFRED REHDER.



551. Kernels of Corn on the cob—Sweet Corn behind, Pop Corn in front (× ½).

CORK is the name applied to the outer impervious part of the bark in plants. In *Euonymus Thunbergianus*, the English maple, the corky barked elm, and other trees and shrubs, it forms wings on the branches. The cork of commerce comes from the bark of *Quercus Ilex* (better known as *Q. Suber*), plantations of which grow in southwestern Eu. The cork tree of the catalogues, *Phellodendron Amurense*, is a curious tree, cult. solely for ornament.

W. W. ROWLEE.

CORN, MAIZE (SWEET and POP). A tender annual, cultivated in America from prehistoric times. The word Maize, Spanish Maiz, is derived from the name Mahiz, which Columbus adopted for this cereal from the Haytians. Maize has not yet been found truly wild. Its close relation to Teosinthe, *Euchlæna Mexicana*, Schrad., is indicated by the known fertile hybrids, or cross-breeds between Teosinthe and Maize. Teosinthe and the only other species which show close botanical relationship to Maize are indigenous to Mexico. Botanists now almost unanimously concede that Maize originated in America, and it is probable that it is indigenous to Mexico. See *Zea.*

The white settlers early learned from the American Indians the use of Maize as an article of food. Several Indian names for certain preparations which they adopted or adapted, have passed into the language of the American people, as, for example, samp, hominy, succotash. They cultivated Maize both as a staple field crop and in the garden under the name of Indian Corn, which name, or the simple name of Corn, remains to the present time its almost exclusive designation throughout the English-speaking portions of the continent. It now holds first rank among the agricultural products of the United States in the area devoted to its cultivation, and in the value of the annual crop. The kinds now commonly found in garden culture are sweet Corns and pop Corns. The other kinds, which are more strictly agricultural, are called field Corns, but in some localities sweet Corn and pop Corn are also found under field culture, the former either as a truck crop or for canneries, the latter to supply the comparatively limited demand in domestic markets. Sweet Corn and Pop Corn only will receive special attention in this article.

BOTANICAL CLASSIFICATION.—Zea almost uniformly has been called by botanists a monotypic genus, its one species being Maize. But Maize is an extremely variable species, including groups which are separated by definite characteristics. As a working classification, that proposed by Sturtevant is the best which has yet appeared. He describes 7 "agricultural species." These are *Zea tunicata*, the pod Corns; *Z. everta*, the Pop Corns (Fig. 551); *Z. indurata*, the Flint Corns; *Z. indentata*, the Dent Corns; *Z. amylacea*, the soft Corns; *Z. saccharata*, the sweet or sugar Corns (Figs. 551, 552); *Z. amyleasaccharata*, the starchy Sweet Corns. *Zea Mays*, Linn., belongs to the natural order of grasses or Gramineæ. Culms 1 or more, solid, erect, 1½–15 ft. tall, or more, terminated by a panicle of staminate fls. (the tassel); internodes grooved on one side: branches ear-bearing or obsolete: lvs. long, broad, channeled, tapering to the pendulous tips, with short, hyaline ligules and open, embracing sheaths: fls. monœcious, awnless, usually proterandrous; staminate fls. in clusters of 2 to 4, often overlapping; one fl. usually pedicelled, the other sessile or all sessile: glumes herbaceous; palea membranaceous; anthers 3, linear. The ear contains the pistillate fls. on a hard, thickened, cylindrical spike or spadix (cob), which is enclosed in many spathaceous bracts (husks); spikelets closely sessile in longitudinal rows, paired in alveoli with hard, corneous margin; 2 fls. on a spikelet, the lower abortive; glumes membranaceous; style single, filiform, very long (silk); ovary usually sessile. Ear variable in length and size, often distichous; grain variable in shape, size and color. See Plate VII.

SWEET CORN (*Zea saccharata*, Sturt. Figs. 551, 552.).—A well-defined species-group, characterized by horny, more or less crinkled, wrinkled or shriveled kernel, having a semi-transparent or translucent appearance. Sturtevant in 1899 lists 61 distinct varieties. He gives the first variety of Sweet Corn recorded in American cultivation as being introduced into the region about Plymouth, Mass., from the Indians of the Susquehanna in 1779. Schenck, in 1854, knew two varieties. It appears, therefore, that the distribution of Sweet Corn into cultivation made little progress prior to the last half of the nineteenth century, green field Corn having largely occupied its place prior to that period.

Sweet Corn is preëminently a garden vegetable, although the large kinds are sometimes grown for silage or stover. As a garden vegetable, it is used when it has reached the "roasting ear" stage, the kernel then being well filled and plump but soft, and "in the milk." The kernel is the only part used for human food. When

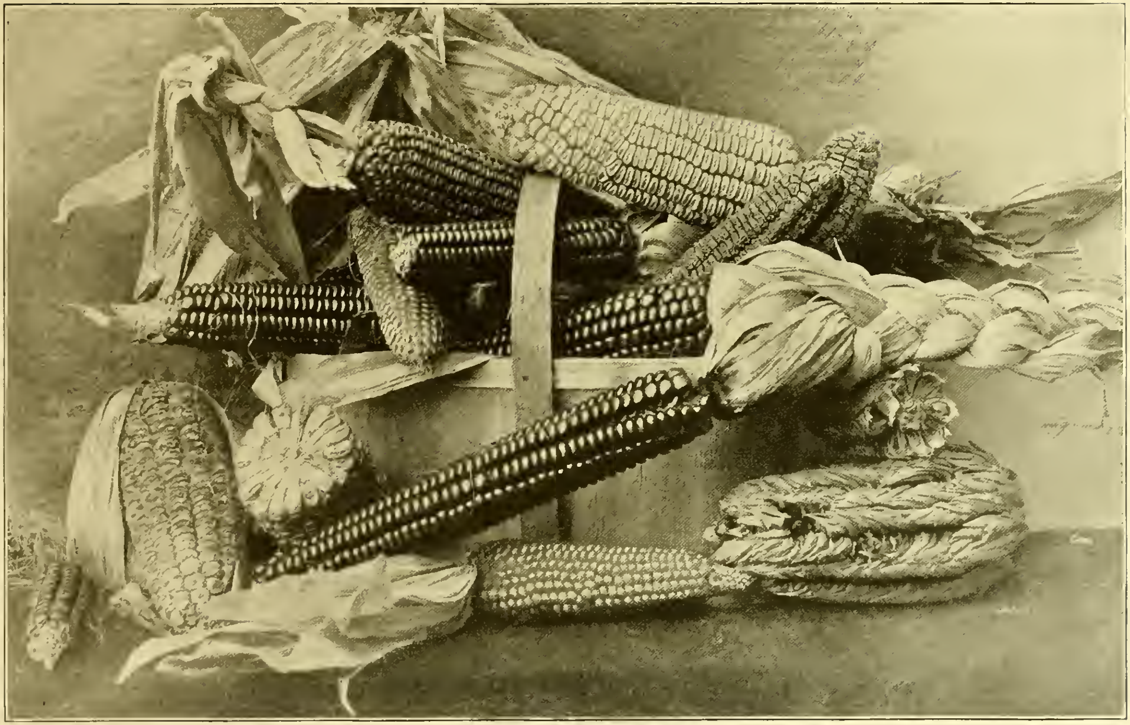


Plate VII. Types of Indian Corn, or Maize

Showing Dent Corn (*Zea indentata*) in the two uppermost ears; Flint Corn (*Zea indurata*) in the braided specimens; Sweet Corn (*Zea saccharata*) on the table on the left and projecting from the basket on the right; Pop Corn (*Zea everta*), one ear on the table and one crosswise in the basket; Pod Corn (*Zea tunicata*), two ears on the table on the right.

Sweet Corn is used as a fresh vegetable it is often cooked and served on the cob. In preparing it for canning or drying, it is always cut from the cob. Dried Sweet Corn, though never an article of commerce, was formerly much used, especially by the rural population. It is gradually being abandoned for canned Corn, for other cereal preparations, or for other vegetables. It is practically unknown as human food outside North America.

Canned Sweet Corn has come to be an important article of domestic commerce in the United States and Canada. A considerable amount goes to Alaska, but at the present time very little is exported. The American Grocer states that the annual Corn pack for the United States and Canada for the year 1898 was 4,398,563 cases, each containing 2 dozen 2-pound tins. New York leads with the production of 1,410,569 cases. Maine, Illinois and Iowa follow in rank in the order named. These four states now pack 80 per cent of the Corn which is canned in the United States and Canada. While these figures are not strictly accurate, they are the best obtainable, and give a general idea of the extent and distribution of this industry. No better canned Corn is put on the market than that produced in Maine, where it is largely grown in localities having a season too short to mature the seed.

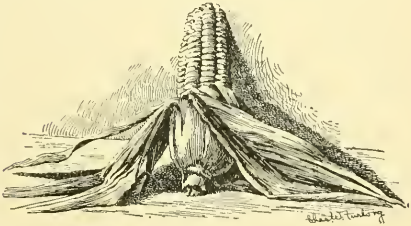
As a rule, Sweet Corn is grown for the canneries under contract. The canning company supplies the seed, guaranteeing it to be good and true to name. The farmer agrees to grow a certain number of acres and deliver the whole crop to the cannery at a stipulated price. The price now paid in western New York is about $10 per ton of good ears, after deducting the ascertained average percentage of husks and rejected ears. Three tons per acre of good ears is considered a good yield. The ears are snapped from the stalks with the husks on and hauled in deep wagon boxes to the canneries. The stalks, when preserved either as ensilage or as stover, make excellent fodder. The overripe and inferior ears, being unmarketable, are left on the stalks and materially increase their value as a food for stock. The stover keeps best in loose shocks. It is liable to heat or mold when closely packed in large stacks or bays.

As a field crop, Corn is grown most extensively on medium heavy loams. It luxuriates in rich, warm soils. The crop rotation should be planned so as to use the coarse manures with the Corn, which is a gross feeder. On the more fertile lands of the central plain, nitrogenous manures may not always be used to advantage with Corn, but in the eastern and southern states, where the soil has lost more of its original fertility, stable manure may often be used profitably with this crop at the rate of from 8 to 10 cords per acre, or possibly more.

Plowing.—In the northern part of the Corn belt in the central and western states, that is to say north of the Ohio and Missouri rivers, deep fall plowing of Corn land is generally favored, but in experiments at the Illinois and Indiana experiment stations, the depth of plowing has had little influence on the crop. In sections of the eastern states, shallow plowing late in spring is favored, especially if the land be in sod. In warmer, drier regions, as in parts of Nebraska and Kansas, listing has been much practiced on stubble ground. The listing plow, having a double mold-board, throws the soil into alternate furrows and ridges, the furrows being 8 or 9 inches deeper than the tops of the ridges. The Corn is planted in the bottom of the furrow, either by means of a 1-horse Corn-drill or by a Corn-drill attachment to the lister plow, consisting of a subsoil plow, through the hollow leg of which the Corn is dropped.

Great care should be used to secure seed-corn having high vitality as a precaution against the rotting of the seed in the soil should the season be cold and wet after planting. Select ears for seed as soon as the Corn is well ripened. Dry them at once by artificial heat so that the seed may better withstand unfavorable conditions of temperature or moisture. In many localities so-called kiln-dried seed is much in favor. In selecting seed for a field crop, seek systematically for stalks having little or no growth of stools and bearing single large ears. For garden use, seed from more productive stalks is desirable, even though the ears be smaller.

In the north, Sweet Corn should be planted as early as can be done without involving great risk of loss from frosts or from rotting of seed in the soil. In New York, field-planting is generally done from May 10 to May 20; in central Minnesota from May 10 to May 30. The ground having been plowed and prepared so as to make a seed-bed of fine, loose soil 3 inches deep, the seed should be planted to a depth of from 1 to 3 inches. The drier and looser the soil the greater should be the depth of planting. In planting small fields, the ground may be marked in check rows so that the hills planted at the intersection of the rows will stand about 3½ feet apart each way, and the Corn planted by a hand-planter, which drops the desired number of kernels each time it is thrust into the ground. For large fields, the check-row type of planter may be used. These planters drop and cover the seed in hills at uniform distances apart, planting two rows at one trip across the field. Field Corn is often planted in drills by machines adapted to this purpose, but Sweet Corn should be grown under intensive culture, and should be in hills, so that the surface of the ground may be kept loose and entirely free from weeds.



552. Early Marblehead Sweet Corn.

Till for the purpose of retaining soil moisture as well as to kill weeds. This requires frequent shallow tillage, pulverizing the surface of the soil so that it will act as a mulch and retard the evaporation of soil moisture. Begin tillage as soon as the planting is done, using the slanting-tooth harrow and Breed's weeder types of implements till the Corn is 6 inches high, after which use spring-tooth cultivators or 2-horse cultivators of the type having several shovels on each side. These are preferable to the double-shovel type, formerly much used. The type having revolving disks, which throw the earth towards the Corn, is objectionable because the center of the furrow is left bare of loose soil, which should cover all the ground as a mulch.

Till at intervals of from 7 to 10 days. At first the cultivator may run from 2 inches deep near the plant to 4 inches deep midway between the rows. Each successive cultivation should gradually increase in depth between the rows; throw a half inch or more of earth towards the Corn and cover the weeds. At the last cultivation the cultivator may be kept a little farther from the Corn. It should leave the soil pulverized to a depth of from 2 to 3 inches over the entire field. The earlier cultivation may be deepened, if necessary, to kill weeds, even though some Corn roots are severed, but cutting the roots by deep cultivation late in the season is to be especially avoided. Till the soil until the Corn gets so large as to prevent the use of a 2-horse cultivator. Occasionally a later cultivation, with a 1-horse cultivator, may be necessary if heavy rains leave the surface soil hard and start the weeds. Often catch crops for late pasturage, cover-crops or crops of winter wheat or rye are sown in the cornfield and cultivated in with the last cultivation. The seed is covered deeply by cultivating it in because the weather is apt to be dry at this period. The lower part of the furrow-slice is thus left compact, furnishing a compact seed-bed, in which small grains delight.

The cultivation of Sweet Corn in the garden should follow the general lines advocated for field culture, but stable manure and commercial fertilizers may be used more liberally. It is well to put a small amount of a complete commercial fertilizer in each hill, and mix it well with the soil before planting the Corn. A fertilizer which has a large amount of nitrogen in quickly available form should be chosen for this purpose. Dwarf early maturing varieties may be planted, for early use, as soon as the ground is sufficiently dry and warm. A little later, when the ground is warmer, the second early main crop and late varieties may be planted. Later successional plantings insure a supply of green Corn till frost kills the plants.

Corn is not grown commercially as a forcing crop. Attempts to force it in winter have not given encouraging results, but it may be successfully forced in spring, following any of the crops of vegetables which are grown under glass, providing the houses are piped so as to maintain the night temperature at 65° F. Provide good drainage. Give a liberal application of stable manure, and thoroughly mix it with the soil. In the latitude of New York the planting may be made as early as the 1st of March. As soon as the first leaf has unfolded the temperature may be allowed to run high in the sun, if the air is kept moist by wetting the floors and walls. The glass need not be shaded. Keep night temperature close to 65° F., not lower and not much higher. After the silk appears, jar the stalks every two or three days, when the atmosphere is dry, and thus insure abundant pollination. Early maturing varieties, like Cory, give edible Corn in about 60 days when thus treated. Corn may be forced in the same house with tomatoes, egg-plant, and other vegetables which require similar range of temperature.

VARIETIES.—Some of the desirable varieties for the garden, the market and for canning are listed below. These varieties are named for the purpose of showing the range of variation and of indicating the leading groups or types, not to recommend these particular kinds. New varieties are continually supplanting the old.

For the home garden.—Extra-early: Early Marblehead (Fig. 552), Burbank Early. Second Early: Crosby Early. Main Crop: Large Eight-Rowed, Hickox Improved, Stowell Evergreen. Late: Black Mexican, Country Gentleman.

For market.—Extra-early: Early Cory, Perry Hybrid; Extra-early Adams, though not a sweet Corn, is largely grown for early use. Second Early: Shaker Early, Crosby Early; Early Adams is grown extensively for market, though not a sweet Corn. Main Crop and Late: Mammoth, Stowell Evergreen, Egyptian, Country Gentleman.

For canning.—Hickox Improved, Crosby Early, Potter Excelsior, Country Gentleman, Egyptian, Old Colony, Stowell Evergreen.

DISEASES AND PESTS.—The most widespread and destructive disease of Corn in the United States is the smut produced by the parasitic smut-fungus, *Ustilago Zeæ*. The sorghum-head smut, *Ustilago Reiliana*, also attacks Maize. Smut causes most injury when it attacks the ears. The grains are transformed into a mass of dark-colored smut spores, and become exceedingly swollen and distorted out of all semblance to their normal outlines. Infection may take place at any growing point of the plant from early till late in the season, hence treatment of seed Corn by fungicides is of no value as a remedy for Corn smut. The destruction of smutted parts of the plants, and taking especial care that the smut does not become mixed with manure which is used for the Corn crop, are measures which may be expected to lessen the prevalence of the disease. No remedy is known.

The only other disease of Sweet Corn which is known to be of economic importance in the United States is the bacterial blight caused by ***Pseudomonas Stewarti***. It has been found in New York, New Jersey and Michigan, but thus far has been seriously destructive only on Long Island on early dwarf varieties of Sweet Corn. It is characterized by wilting and complete drying of the whole plant, as if affected by drought, except that the leaves do not roll up. The fibro-vascular bundles become distinctly yellow, and are very noticeable when the stalk is cut open. The disease attacks the plant at any period of growth, but is most destructive about the time the silk appears. No remedy is known.

Over 200 species of insects are known to be injurious to Corn, either to some part of the growing plant or to the stored product. The Corn worm is also known south as the cotton-boll worm. It is destructive to Sweet Corn especially, for it burrows into the ear and feeds on the tender green Corn, rendering the ear unacceptable either at canneries or in market. It is known to do serious damage as far north as western New York. The best known method of fighting this insect is the breaking of the pupæ cells in the earth by shallow fall plowing, which, at best, is but a partial remedy. Wire-worms, northern corn-root worms, white grubs, and certain other grass insects attack Corn plants. One of the best preventive measures is to plan the rotation so that Corn does not immediately follow any cereal or grass crop.

POP CORN (*Zea everta*, Sturt.).—Characterized by the excessive proportion of the corneous endosperm, and the small size of the kernels and ear. The kernel split laterally shows the chit and corneous matter enveloping, and in some cases a fine, starchy line. The small size of the kernel and the property of popping makes identification certain. This species-group extends throughout North and South America, and has claims for prehistoric culture.

The preparation of soil, planting, and tillage recommended for Sweet Corn apply equally well to Pop Corn.

Varieties.—Sturtevant, in 1899, describes 25 varieties. The following kinds are popular:

Dwarf Golden.—Ear 1 to 3 inches long. An early-maturing sort, with broad, golden yellow kernels.

Rice, White Rice.—Ear 4 to 8 inches long. This vigorous late variety is widely cultivated. This and other Rice Corns are characterized by deep, tapering, beaked kernels.

Pearl.—Ear 4 to 8 inches long. Matures somewhat earlier than Rice and later than Dwarf Golden. Kernels rounded and silvery white.

S. A. BEACH.

CORN, BROOM. See *Sorghum*.

CORN COCKLE. *Lychnis Githago*.

CORNEL, CORNELIAN CHERRY. See *Cornus Mas*.

CORN FLAG. *Gladiolus*.

CORNFLOWER. *Centaurea Cyanus*.

CORN, INDIAN. The common name for *Zea Mays*.

CORN, KAFFIR. See *Sorghum vulgare*, var. *Durra*.

CORN POPPY of Europe is the weed of the grain fields from which some of the garden poppies have been raised, *Papaver Rhœas*.

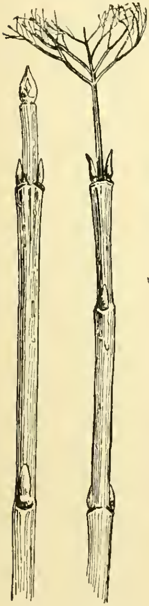
CORN SALAD (*Valerianella olitoria*, Pall.). *Valerianàceæ*. Known also as Lamb's Lettuce, Fetticus, and Vetticost. It is a native of Europe. Sow the seed in early spring, at the time of the first sowing of lettuce, and make successional plantings as often as desired. For very early salads the seeds are planted in September, and the young plants are covered with a light mulch and wintered exactly as spinach is often managed. Sow in drills a foot or 18 inches apart and cover lightly. Work the ground thoroughly, and give an abundance of water. The leaves may be blanched, but are usually eaten green. It matures in 60–65 days during good spring weather. Only one variety is offered by most American seedsmen, but several sorts are known to European gardeners. It is sometimes used for a pot-herb, being served like spinach, but is chiefly valuable for salads. It is rather tasteless, and is not so popular as cress or lettuce on that account, but persons who prefer a very mild salad, or who would rather taste the salad dressing, will doubtless fancy Corn Salad. It is best served in mixture with other herbs, as lettuce, water cress or white mustard. It is easy to grow. There are no special enemies.

F. A. WAUGH.

CÓRNUS (ancient Latin name of *Cornus Mas*). *Cornàceæ*. DOGWOOD. Shrubs or trees, rarely herbs: lvs. opposite, rarely alternate or whorled, deciduous, entire: fls. small, 4-merous, usually white, in terminal cymes (Fig. 553) or heads: fr. a drupe, with 2-celled stone. Over 30 species in the temperate regions of the northern hemisphere and one in Peru. Hardy ornamental shrubs

Corn being made ready for the market

with handsome foliage, often assuming a brilliant fall coloring, and with attractive fls. and frs. Nearly all are very desirable for planting in shrubberies. They grow nearly as well in shady places under large trees as in sunny exposed situations, and thrive in almost any soil. One of the most beautiful in bloom is *C. florida*, with extremely showy fls. in spring. *C. candidissima* is one of the best for shrubberies, blooming profusely in June. The red-branched species, as *C. alba*, *C. Amomum*, *C. Baileyi*, *C. sanguinea*, are very attractive in winter. Prop. by seeds, which usually do not germinate until the second year. The species with willow-like soft wood, as *C. alba* and its allies, grow readily from cuttings of mature wood, while the others are sometimes increased by layers. Horticultural varieties are mostly budded in summer on seedlings of the type, or grafted in early spring in the propagating house. They are often grown in this country from nearly ripened cuttings (Fig. 554), handled in frames in summer.



553.
Cornus winter shoots.
Showing the opposite bud and terminal flower-clusters. *Cornus Baileyi.*

554. Cutting of Cornus.

Various species of Cornus have many interesting uses. Our native *C. florida*, which in flower is the showiest member of the genus, furnishes a useful substitute for quinine. The bark of all parts contains the same substances found in Cinchona, but in different proportions. It is inferior in effectiveness and more difficult to obtain in large quantities. It is sometimes possible to ward off fevers by merely chewing the twigs. The powdered bark makes a good tooth-powder, and the fresh twigs can be used for the same purpose. The bark mixed with sulfate of iron makes a good black ink. The bark of the roots yields a scarlet dye. The wood, being hard, heavy, and close-grained, is good for tool handles. The Cornelian Cherry has pulpy fruits resembling cornelian in color and about the size and shape of olives, for which they can be substituted. The ripe fruits are soft and rather sweet. The name Dogwood comes from the fact that a decoction of the bark of *C. sanguinea* was used in England to wash mangy dogs. The small red berries of *C. Suecica* (not in the trade) are eaten by the Esquimaux.

Index: alba, 3 and 4; alternifolia, 1; Amomum, 7; Baileyi, 5; *brachypoda*, 2 and suppl.; Canadensis, 17; candidissima, 9; capitata, 16; circinata, 6; *cœrulea*, 7; *fastigiata*, 10; *femina*, 10; florida, 13; *Japonica*, 15; Kousa, 15; macrophylla, 2; Mas, 11; *mascula*, 11; Nuttalli, 14; *oblongata*, 9; officinalis, 12; *paniculata*, 9; sanguinea, 8; *sericea*, 7; Sibirica, 4; stolonifera, 3; stricta, 10; *Tatarica*, 4.

A. *Shrubs or trees.*

B. *Fls. in cymes or panicles without involucre.*

C. *Foliage alternate: fls. in umbel-like cymes, cream-colored.*

1. **alternifòlia,** Linn. Fig. 555. Shrub or small tree, to 25 ft.: lvs. slender-petioled, elliptic or ovate, usually cuneate, acuminate, nearly glabrous above, pale or whitish beneath and appressed pubescent, 3–5 in. long: cymes 1½–2½ in. wide: fr. dark blue, globular, ⅓in. across, on red peduncles. May, June. N. Brunswick to Georgia and Alabama, west to Minnesota. S.S. 5:216. Em. 463.—Of very distinct habit, the branches being arranged in irregular whorls, forming flat, horizontally spreading tiers, as in the picture. A variety which shows this habit more distinctly than the common form is var. **umbraculifera,** Dieck. Var. **argéntea,** Hort., is a form with white-marked foliage.

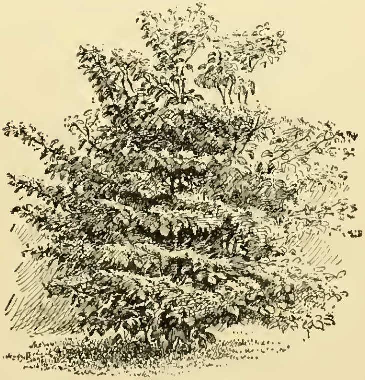
2. **macrophýlla,** Wall. (*C. brachýpoda*, Auth., not C. A. Mey.). Tree, to 60 ft.: lvs. slender-petioled, broadly ovate or elliptic ovate, usually rounded at the base, abruptly acuminate, whitish and slightly hairy beneath, 3–5 in. long: cymes 3–4 in. wide: fr. bluish black. June. Himalayas to Japan.—With the habit of the former, but of more vigorous growth; not hardy north. Var. **variegàta,** Hort. Lvs. edged white. Gng. 3:67.

CC. *Foliage opposite.*

D. *Fls. in umbel-like, flat cymes.*

E. *Lvs. whitish and with straight appressed hairs beneath: fr. white or light bluish.*

3. **stolonífera,** Michx. (*C. álba*, Wangh). RED-OSIER DOGWOOD. Fig. 556. Shrub, to 8 ft., usually with dark blood-red branches and prostrate stem, stoloniferous: lvs. obtuse at the base, ovate or oblong-lanceolate, acuminate, 2–5 in. long: cymes dense, 1–2 in. wide; disk usually red: fr. white, with the stone broader than high. May, June. From Brit. N. Amer. to Illinois and California. B.B. 2:545. G.C. II. 8:679.—Var. **flaviràmea,** Späth. Branches yellow. There are also varieties with variegated lvs. Habit bush-like, as in the picture.



555. Cornus alternifolia.

4. **álba,** Linn. (*C. Tatárica,* Mill.). Shrub, to 10 ft., with usually erect stem and bright blood-red branches, mostly with glaucous bloom when young: lvs. obtuse at the base, ovate or elliptic, somewhat bullate or rugose above, acute, 1½–3½ in. long: cymes dense, small; disk yellow: fr. light bluish, sometimes whitish; stone usually higher than broad, flat. Siberia, N. China.—Var. **argénteo-marginàta,** Hort. Lvs. edged white. Var. **Spæthi,** Hort. Lvs. broadly edged yellow. Var. **Sibirica,** Lodd. Branches bright coral-red. There are also some other varieties with variegated lvs.

556. Cornus stolonifera.

EE. *Lvs. with woolly pubescence beneath, rarely nearly glabrous.*

F. *Fruit white.*

5. **Bàileyi,** Coult. & Evans. Fig. 553. Erect shrub, with reddish branches: lvs. ovate to lanceolate, acute or acuminate, white beneath, with woolly and with appressed hairs, 2–5 in. long: fls. in small rather compact woolly cymes: stone of the fruit much broader than high, compressed and flat-topped. Pa. to Minn. and Wyoming. G.F. 3: 465.—A very handsome species of upright growth, with dark red branches, blooming nearly all summer, and of a distinct grayish hue, due to the slightly upward curled lvs. The fall color of foliage and winter color of twigs are unequaled. Not as yet in the trade. Well adapted for sandy soil.

FF. *Fr. black, blue or bluish or greenish white.*

6. **circinàta,** L'Hérit. Shrub, 3–10 ft.: the young branches green, blotched purple, older ones purplish: lvs. orbicular or broadly ovate, acute or short-acuminate, slightly pubescent above, pale and densely pubescent beneath, 2–6 in. long: cymes rather dense: fr. light blue or greenish white. May, June. Em. 464.

7. **Amómum,** Mill. (*C. sericea,* Linn. *C. cærùlea,* Lam.). Shrub, 3–10 ft., with purple branches: lvs. rounded or narrowed at the base, elliptic-ovate or ovate-lanceolate, dark green and nearly glabrous above, pale or whitish beneath, usually with brownish hairs on the veins, 2–4 in. long: cyme compact: fr. blue or bluish white. June, July. N. Brunswick to Florida, west to Texas and Dakota. Em. 466. R.H. 1888: 444 (as *C. stolonifera*).—Var. **variegàta,** Hort. Lvs. variegated with yellowish white.

8. **sanguinea,** Linn. Shrub, to 12 ft., with purple or dark blood-red branches: lvs. broad-elliptic or ovate, rounded or narrowed at the base, usually pubescent on both sides, pale green beneath, 1½–3½ in. long: fls. greenish white, in dense cymes: fr. black. May, June. Eu., Orient.—Var. **variegàta,** Hort. Lvs. variegated with yellowish white. Var. **viridissima,** Dieck. With green branches and green fruit.

DD. *Fls. in short panicles: fr. white or pale blue.*

9. **candidíssima,** Marsh. (*C. paniculàta,* L'Hérit. *C. oblongàta,* Hort.). Shrub, 6–15 ft., with gray branches: lvs. cuneate, ovate-lanceolate or lanceolate, acuminate, appressed-pubescent or nearly smooth, whitish beneath, 1½–4 in. long: petals white, lanceolate: fr. white. May, June. Maine to N. Carolina, west to Minnesota and Nebraska. B.B. 2: 545.—Free-flowering; very handsome when in bloom, and with its white fruits on red peduncles in fall.

10. **stricta,** L'Hérit. (*C. fastigiàta,* Michx. *C. fæmina,* Mill.). Shrub, to 15 ft., with purplish branches: lvs. ovate or ovate-lanceolate, sparingly and minutely appressed-pubescent, green on both sides, 1½–3 in. long: petals white, ovate-lanceolate: fr. pale blue. April, May. Virginia to Georgia and Florida. B.B. 2: 546.—Tender north. Closely allied to the former, and perhaps only variety.

BB. *Fls. in dense heads or umbels, with an involucre.*

C. *Fls. yellow; involucre yellowish, not exceeding the fls.*

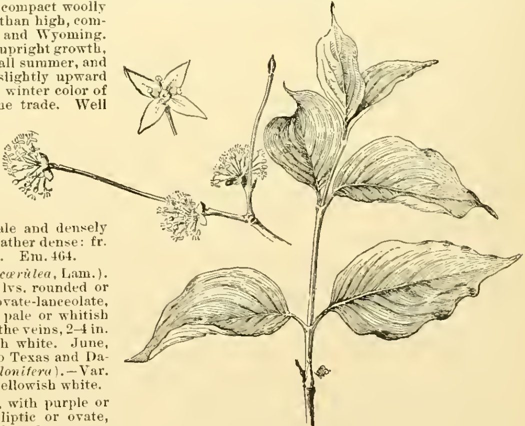
11. **Más,** Linn. (*C. máscula,* Hort.). CORNELIAN CHERRY. Fig. 557. Shrub or small tree, to 20 ft.: lvs. ovate or elliptic, acute, appressed-pubescent, and green on both sides, 1½–3½ in. long: fls. in sessile opposite umbels, before the lvs.; pedicels not exceeding the involucre: fr. oblong, scarlet, ¾ in. long, edible. March, April. S. Eu., Orient. Mn. 5: 192.—Handsome shrub of dense growth with glossy foliage, very attractive in early spring with its yellow fls., and again in fall with its shining scarlet frs. There are varieties with variegated lvs. and with yellow fr.

12. **officinalis,** Sieb. & Zucc. Shrub or small tree, to 15 ft.: lvs. elliptic, acuminate, pale green beneath and with large tufts of dark brown hairs in the axils of the veins: fls. like those of the former; pedicels longer than the involucre: fr. scarlet, oblong. Japan, China. S.Z. 50.—Very similar to the last.

CC. *Fls. greenish yellow, sessile, with a showy white involucre, much exceeding the fls.*

D. *Frs. in dense clusters, but individually distinct. (Benthamidia.)*

13. **flórida,** Linn. FLOWERING DOGWOOD. Fig. 558. Shrub or small tree with spreading branches, 10–15 ft., rarely to 40 ft.: lvs. oval or ovate, acute, dark green and glabrous above, glaucous or whitish beneath, usually only pubescent on the veins, 3–6 in. long: involucre white



557. Cornus Mas (sprays × ½).

or pinkish, 3–4 in. wide; bracts 4, obovate, emarginate: fr. ½in. long, scarlet. May. Massachusetts to Florida, west to Ontario and Texas, also E. and S. Mexico. S.S. 5:112–13. Em. 468. G.F. 3:431. B.M. 526. Gn. 52, p. 177; 53, p. 222. J.H. III. 28:453.—One of the most beautiful American flowering trees; hardy north. Var. **péndula,** Hort. With pendulous branches. Var. **rùbra,** Hort. With pink involucre, but less free-flowering than the type. R. H. 1894:500. A.G. 18:441. F. E. 9:572. Neither variety as hardy as the type.

14. **Núttalli,** Aud. Tree, to 80 ft.: lvs. ovate or obovate, usually pubescent beneath, 4–5 in. long: involucre white or tinged with pink, 4–6 in. across; bracts 4–6, oblong or obovate, sometimes roundish, mostly acute: fr. bright red or orange, crowned with the broad, persistent calyx. Brit. Columbia to S. Calif. S.S. 5:214–15. Gng. 6:274.—This species surpasses the former in beauty, but is more tender and has not yet been successfully cultivated outside of its native country, though introduced at several times into different American and European gardens.

DD. *Frs. connate into a globular fleshy head.* (*Benthamia.*)

15. **Koùsa,** Buerg. (*Benthàmia Japónica,* Sieb. & Zucc. *C. Japónica,* Koehne, not Thunbg.). Shrub or small tree, to 20 ft.: lvs. cuneate, elliptic-ovate, acuminate, dark green above, glaucous and appressed-pubescent beneath, 2–4 in. long: involucre creamy white, 2½–3 in. wide; bracts ovate, acute: frs. forming a globular head. June. Japan, China. S.Z. 16. Gn. 43: 898 G.C. III. 19:783. A.G. 13:674. Gng. 3:149. J.H. III. 35:9. M.D.G. 1899:328–9.—Fls. very showy, appearing after the lvs. in June and contrasting well with the bright green foliage; hardy as far north as Mass. Sometimes variegated.

16. **capitàta,** Wall. (*Benthàmia fragífera,* Lindl.). Tree: lvs. coriaceous, elliptic-oblong, narrowed at both ends, appressed-pubescent above and more densely and whitish beneath, 2–4 in.: involucre about 2½–3 in. wide, creamy white; bracts ovate, acute: fruit-head over 1 in. across, scarlet. June. Himalayas. B.R. 19:1579. Gn. 54, p. 310. G.C. III. 16:501. J.H. III. 30:213.—Evergreen tree, with showy fls. and frs.; hardy only south.

AA. *Low herbs: fls. in dense heads, with a white (or pinkish) involucre.*

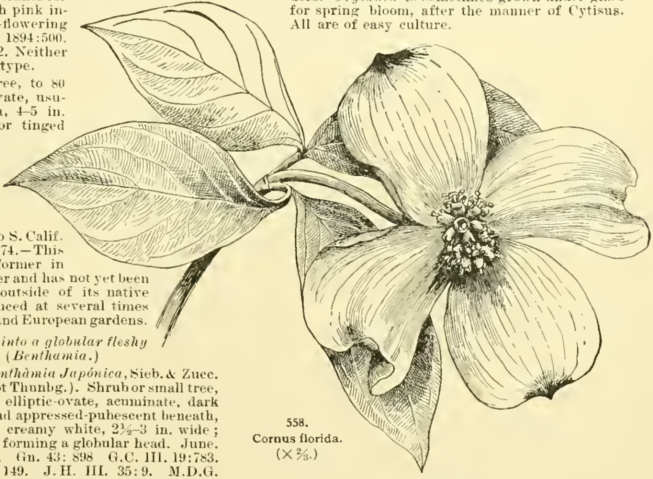
17. **Canadénsis,** Linn. Herb, ⅓–⅔ ft. high, with creeping rootstock: lvs. whorled, sessile, elliptic or obovate, glabrous or nearly so, 1–3 in. long: head greenish, long-peduncled; involucre white, 1–1½ in. wide: fr. bright red, globose. May–July. N. Amer., south to Indiana, Colorado and Calif. B. M. 880.—Handsome plant for half-shady places.

C. asperifòlia, Michx. Shrub, 8–15 ft.; branches reddish brown: lvs. rough above, woolly-pubescent beneath: fr. white. Ontario to Florida, west to Texas. G.F. 10:105.—*C. brachýpoda,* C. A. Mey. Shrub: lvs. opposite, glaucous and appressed-pubescent beneath: panicles large, loose. See C. macrophylla in the main list. Japan, China.—*C. glabràta,* Benth. Shrub, to 10 ft.; branches gray: lvs. small, nearly glabrous, green and shining on both sides: fr. white. Oregon to Calif.—*C. Héssei,* Koehne. Allied to C. alba. Dwarf, dense shrub: lvs. crowded, small: fr. bluish white. Probably from E. Asia.—*C. oblònga,* Wall. Shrub or tree, to 30 ft.: lvs. narrow-oblong, nearly glabrous, glaucous beneath, coriaceous: fls. white, fragrant, in cymose panicles. Himalayas.—*C. pubéscens,* Nutt. Shrub, to 15 ft., with purple branches: lvs. nearly glabrous above, glaucous and woolly-pubescent beneath: fr. white. Brit. Columbia to Calif.—*C. Suècica,* Linn. Allied to C. Canadensis: lvs. all opposite: fl.-head purple, the white involucre 1 in. or less wide. Arctic Amer., N. Eu., N. Asia. B.B. 2:543.

Alfred Rehder.

CORONA. Same as *crown.*

CORONÍLLA (Latin, a *little crown:* from the arrangement of the fls.). *Leguminòsæ,* tribe *Hedysàreæ.* Crown Vetch. Perennial shrubs or herbs, with odd-pinnate lvs., and purple or yellow fls. in peduncled heads or umbels; pod jointed. Separated from Ornithopus by floral and fruit characters. Species 25–30, Mediterranean region. The shrubby *C. Emerus* and *C. glauca* are useful in southern California and the southern states. The species are occasionally grown in borders. *C. glauca* is sometimes grown under glass for spring bloom, after the manner of Cytisus. All are of easy culture.



558. Cornus florida. (×⅔.)

A. *Flowers yellow.*

B. *Herbs.*

Cappadòcica, Willd. (*C. Ibèrica,* Bieb.). Low perennial herb, about 1 ft. high: lfts. 9–11, obcordate, ciliate: umbels 7–8-fld.: fls. yellow, large, July–Aug.: stipules membranaceous, rounded, ciliate-toothed. Asia Minor. L.B.C. 8:789. B.M. 2646.—A good trailer for rockeries and the margins of borders.

BB. *Shrubs.*

Emèrus, Linn. Scorpion Senna. Dense, symmetrical shrub, 4–6 ft. high: lvs. deep, glossy green; lfts. 5–7, obovate; stipules small: peduncles 3-fld.: fls. large, yellow, tipped with red. Blooms freely, May and June. Showy, half-hardy. S. Eu. B.M. 445. Gng. 5:36.—Evergreen in S. states.

glaùca, Linn. Glabrous shrub 2–4 ft. high: stipules small, lanceolate: lfts. 5–7, obovate, very blunt, glaucous: fls. 7–8 in each umbel, yellow, fragrant by day but not at night. S. Eu. B.M. 13.—One of the common garden shrubs of S. Calif., flowering all the year.

AA. *Flowers white and pink.*

viminàlis, Salisb. Trailing shrub: stipules soon deciduous, ovate, membranaceous: lfts. 13–21, obovate, notched, glaucous: umbels 6–10-fld.: fls. pale red or white with a red stripe on the banner. Algeria.—Promising as a florists' plant for cut fls. Fls. all the year in S. Calif.

vària, Linn. Crown-Vetch. Fig. 559. Straggling or ascending, smooth herb, 1–2 ft. high: lvs. sessile; lfts. 11–25, oblong or obovate, blunt and mucronate, ½–¾ in. long: peduncles longer than lvs.: fls. in dense umbels, ½ in. long, pinkish white. June to Oct. Eu. B.M. 258. Gng. 5:337.—Trailing plant for hardy, herbaceous border.

Jared G. Smith.

CORRÈA (after Jose Francesco Correa de Serra, Portuguese author, 1750–1823). *Rutàceæ.* Seven species of tender Australian shrubs, rarely cultivated under glass for their pendulous, tubular fls. an inch or two long, usually bright scarlet, but also white or yellow. Shrubs, usually with dense, minute, stellate hairs: lvs. opposite, stalked, entire, and with transparent dots. *C. speciosa* is probably the best and most variable species. It is a native of barren, sandy plains, and belongs to the large and much-neglected class of Australian shrubs.

559. Coronilla varia. (× ½.) (See p. 379.)

speciòsa, Ait. (*C. cardinàlis*, F. Muell.). Tender shrub, 2–3 ft. high: branches slender, brown, opposite, covered with minute rusty hairs: lvs. opposite, about 1 in. long, elliptic, about a fourth as wide as long, wrinkled, dark green above, whitish below, margin entire, recurved: peduncles opposite, axillary, longer than the lvs., 1-fld., with a pair of leafy bracts: fls. 1½ in. long, pendent, tubular, bright scarlet, with a very short limb of 4 spreading, greenish yellow segments; calyx small, cup-shaped, with 4 almost obsolete teeth; stamens 8, exserted, about ¼ in. B.M. 4912.—There are several varieties.

W. M.

CORTADÈRIA. See *Gynerium.*

CORTÙSA (named by the herbalist Matthiolus after his friend Cortusus, professor of botany at Padua). *Primulàceæ.* A genus of possibly 4 species of which *C. Matthioli*, Linn., from the Swiss Alps, has long been a choice and delicate but not very popular plant, suited for shady parts of the rockery. It was long considered the only species of the genus. It is an herbaceous perennial, about 6 in. high, pubescent, rhizomatous, with a few long-stalked, cordate, 7–9-lobed, dentate lvs., and a slender scape bearing an umbel of about 7 small, rosy purple, drooping fls., which appear in summer. It has some resemblance to *Primula cortusioides.* The genus has possibly 4 species, and is distinguished from Primula and Androsace by its stamens attached to the base of the corolla, and its long-acuminate anthers. According to J. B. Keller, its culture is similar to that of the hardy Primulas, but it needs winter protection in the northern states.

CORYÁNTHES (Greek, *korys*, helmet, and *anthos*, flower, referring to the shape of the lip). *Orchidàceæ*, tribe *Vándeæ.* This complex genus, which is closely related to Stanhopea, is represented by several interesting species inhabiting tropical America. Sepals spreading, dilated, flexuose, conduplicate, lateral ones largest, distinct at the base: petals small, erect: labellum large, tridentate, basal portion forming a hood, continued into the column; distal portion bucket or pouch-like: column pointing downwards, elongated, terete, bicornute at the base, apex recurved: pollinia 2, compressed, caudicle linear, arcuate. Pseudobulbous: lvs. plicate, lanceolate, about 1 ft. long. The bucket part of the labellum is provided with a spout-like structure, by means of which the bucket overflows when about half full of a secretion which drops from a pair of glands near the base of the column. The fls. of the species known are not lasting, the sepals being of such delicate texture that, though at first they fully expand, they soon collapse and become unsightly. Although much interest attaches to the species of Coryanthes, the genus is not generally cultivated, since the fls. last too short a time and are not particularly brilliant. For culture, see *Stanhopea.*

macrántha, Hook. Ground color rich yellow dotted with red. Hood and part of bucket brownish red: fls. few, in drooping racemes. Caracas. P.M. 5:31.

maculàta, Hook. Sepals and petals dull, pale yellow, bucket blotched on the inside with dull red. B.M. 3102. —Var. **punctàta** has the petals and sepals bright yellow, speckled with red, the hood yellow, blotched with reddish orange, the pouch pale, speckled and spotted with red. Demerara.

OAKES AMES.

CORÝDALIS (Greek, *lark*, the spur of the flower resembling a lark's spur). *Fumariàceæ.* A large genus of hardy plants allied to the Dutchman's Breeches, and with finely cut foliage of a similar character, but weedier and less delicate than the Dicentras. They are all of easy culture. They prefer full sunlight but will grow in half-shade. Prop. by division or seed.

A. *Fls. chiefly purple or rose, sometimes tipped yellow.*

B. *Plant perennial: root tuberous: stem-lvs. few.*

bulbòsa, DC. (*C. sólida*, Sw.). Erect, 6 in. high: lvs. 3–4, stalked, biternately cut, segments wedge-shaped or oblong: root solid: fls. large, purplish. Spring.

BB. *Plant annual: root fibrous: stem-lvs. many.*

glaùca, Pursh. Annual, 1–2 ft. high, very glaucous: lobes of the lvs. mostly spatulate: racemes short, panicled at the naked summit of the branches: fls. barely ½ in. long, rose or purple with yellow tips: spur short and round: capsule slender, linear; seeds with minute, transverse wrinkles. Summer. Rocky or sterile ground, Nova Scotia to Rocky Mts., and even Arctic coast, south to Texas. B.M. 179.—Not advertised for sale, but probably worth cult.

AA. *Fls. chiefly yellow.*

B. *Plant perennial: root tuberous: stem-lvs. few.*

nóbilis, Pers. Perennial, erect: lvs. bipinnately cut; segments wedge-shaped and lobed at the apex: fls. white, tipped with yellow, and a dark purple spot: spur 1 in. long. Spring. Siberia. B.M. 1953, as *Fumaria nobilis.* G.C. II. 19:725.

BB. *Plant annual or biennial: root fibrous: stem-lvs. numerous.*

aùrea, Willd. Annual, 6 in. high, commonly low and spreading: fls. golden yellow, about ½ in. long, on rather slender pedicels in a short raceme; spur barely half the length of the body, somewhat decurved: capsules spreading or pendulous, about 1 in. long; seeds 10–12, turgid, obtuse at margin, the shining surface obscurely netted. Rocky banks of Lower Canada and N. New England, northwest to latitude 64°, west to Brit. Col. and Ore., south to Tex., Ariz. and Mex.; not Jap.—The western forms have the spur almost as long as the body of the corolla and pass into

Var. **occidentàlis**, Engelm. More erect and tufted, from a stouter and sometimes more enduring root: fls. larger; spur commonly ascending: capsules thicker; seeds less turgid, acutish at margins. Colo., New Mex., W. Tex., Ariz. Cult. by D.M. Andrews, Boulder, Colo., who considers it biennial.

curvisíliqua, Engelm. Probably a biennial. Commonly more robust than *C. aurea*, ascending or erect, 1 ft. high or less: fls. golden yellow, over ½ in. long, in a spike-like raceme; spur as long as the body, commonly ascending: capsules quadrangular, 1½ in. long; seeds turgid to lens-shaped, with acute margins densely and minutely netted. Woods in Tex. Cult. by D. M. Andrews, Boulder, Colo.

lutea, DC. Erect or spreading, 6–8 in. high, annual, or forming a tufted stock of several years' duration: lvs. delicate, pale green, much divided; segments ovate or wedge-shaped, and 2–3-lobed: fls. pale yellow, about ½ in. long, in short racemes; spur short: pod a fourth or third of an inch long. Stony places of S. Eu., and runs wild in Eu.

C. càva, Schweigg. & Kort. (probably a form of C. tuberosa, DC.) is somewhat larger than C. bulbosa, with pretty fls. varying into purplish and white. Eu.—*C. Scoùleri*, Hook., grows 3 ft., and is cult. in some European gardens. W. Amer.

W. M.

CORYLÓPSIS (*Corylus* and *opsis*, likeness; in foliage resembling the Hazel). *Hamamelidàceæ*. Deciduous shrubs, rarely trees: lvs. alternate, deciduous, dentate: fls. in nodding racemes, appearing before the lvs., yellow; petals and stamens 5: fr. a 2-celled, dehiscent capsule, with 2 shining black seeds. Six species in E. Asia and Himal. Low ornamental shrubs, with slender branches and pale bluish green, distinct foliage; very attractive in early spring, when covered with yellow, fragrant fls. Not hardy north of New York. They grow best in peaty and sandy soil. Prop. by seeds sown in spring, best with slight bottom heat, and by cuttings of half-ripened wood in summer under glass; also by layers, rooting readily in moderately moist, peaty soil.

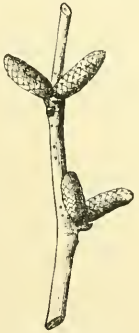
pauciflòra, Sieb. & Zucc. Low, much-branched shrub, 2–3 ft.: lvs. obliquely cordate, ovate, sinuate-dentate, ciliate, pubescent and glaucous beneath, 1–2 in. long: racemes 2–3-fld., ½–¾ in. long: fls. light yellow. Jap. S.Z. 20. G.F. 5:342. Gt. 48:1467.

spicàta, Sieb. & Zucc. Shrub, to 4 ft.: lvs. oblique and rounded or cordate at the base, roundish ovate or obovate, sinuate-dentate, glaucous beneath and pubescent, 2–3½ in. long: racemes 7–10-fld., 1–2 in. long: fls. bright yellow. Jap. S.Z. 19. B.M. 5458. F.S. 20:2135. R.H. 1869, p. 230; 1878, p. 198.—This species has larger and handsomer foliage and fls. of a deeper yellow, in longer racemes, but *C. pauciflora* flowers more profusely and is somewhat hardier.

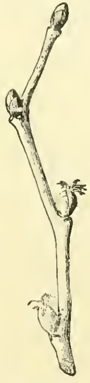
C. Himalayàna, Griff. Shrub or small tree, to 20 ft.: lvs. cordate-ovate, 4–7 in.: racemes 1–2½ in. long. Himal. B.M. 6779. Tender.

Alfred Rehder.

CÓRYLUS (ancient Greek name). *Cupuliferæ*, tribe *Betulàceæ*. Hazel. Filbert. Cobnut. Shrubs, rarely trees: lvs. alternate, deciduous, stipulate, petioled, serrate and more or less pubescent: fls. monœcious, appearing before the lvs., staminate, in long, pendulous catkins, formed the previous year, and remaining naked during the winter (Fig. 560), each bract bearing 4 divided stamens; pistillate included in a small, scaly bud with only the red styles protruding (Fig. 561): fr. a nut, included or surrounded by a leafy involucre, usually in clusters at the end of short branches. Eleven species in N. Amer., Eu. and Asia are described. Numerous varieties are cult. in Eu. for their edible nuts. They are also valuable for planting shrubberies, and thrive in almost any soil. Prop. by seeds sown in fall, or stratified and sown in spring; the varieties usually by suckers, or by layers, put down in fall or spring; they will be rooted the following fall. Budding in summer is sometimes practiced for growing standard trees, and grafting in spring in the greenhouse for scarce varieties. They may also be increased by cuttings of mature wood taken off in fall, kept during the winter in sand or moss in a cellar and planted in spring in a warm and sandy soil. Illustrated monograph of the cultivated varieties by Franz Goeschke, Die Haselnuss (1887). See, also, bulletin on Nut-culture by the U. S. Dept. of Agr.



560. Winter catkins of Filbert.



561. Pistillate flowers of Corylus rostrata. Natural size.

A. *Husk or involucre consisting of two distinct bracts (sometimes partly connate).*

B. *Involucre deeply divided into many linear, nearly entire segments, densely beset with glandular hairs. Tree.*

Colùrna, Linn. Tree, to 70 ft.: lvs. deeply cordate, roundish ovate to ovate-oblong, slightly lobed and doubly crenate-serrate, at length nearly glabrous above, pubescent beneath, 3–7 in. long: nut roundish ovate, 4-5 in. long. From S. Eu. to Himal.—Ornamental tree, with regular pyramidal head, not quite hardy north. Rarely cult. for the fr. under the name of Filbert of Constantinople or Constantinople nut.

B. *Involucre sparingly glandular, with lanceolate or triangular-dentate lobes: nut slightly compressed. Shrubs.*

Americàna, Walt. Fig. 562. Shrub, 3–8 ft.: lvs. slightly cordate or rounded at the base, broadly ovate or oval, irregularly serrate, sparingly pubescent above, finely tomentose beneath, 3–6 in. long: involucre compressed, exceeding the nut, the 2 bracts sometimes more or less connate, with rather short, irregular, toothed lobes: nut roundish ovate, about ½ in. high. From Canada to Fla. west to Ontario and Dak. B.B. 1:507.—Two forms of involucre are shown in Fig. 562. This figure is adapted from the bulletin of the Dept. of Agr. on Nut-culture.

Avellàna, Linn. Figs. 560, 562. Shrub, to 15 ft.: lvs. slightly cordate, roundish oval or broadly obovate, doubly serrate and often slightly lobed, at length nearly glabrous above, pubescent on the veins beneath: involucre shorter than the nut, deeply and irregularly incised: nut roundish ovate, ½–¾ in. high. Eu., N. Afr., W. Asia.—Var. **aùrea**, Hort. Lvs. yellow. Var. **laciniàta**, Hort. (var. *heterophylla*, Loud.). Lvs. laciniately incised or lobed. Var. **péndula**, Hort. With pendulous branches. There are also many varieties cultivated for their fruit.

AA. *Husk tubular, of connate bracts.*

B. *Involucre campanulate, with large, dentate, spreading lobes.*

Póntica, Koch. Shrub: lvs. cordate, roundish ovate or broad-oval, doubly serrate: involucre finely pubescent, with few glandular hairs at the base: nut large, broad-ovate. W. Asia. F.S. 21: 2223-4 as *C. Colurna.*—From this species the Cob Nuts seem to have originated; also the Spanish Nuts are probably mostly cross-breeds between this species and *C. Avellana* or *C. maxima*, or between the two latter species.

BB. *Involucre narrowed above the nut into a beak.*

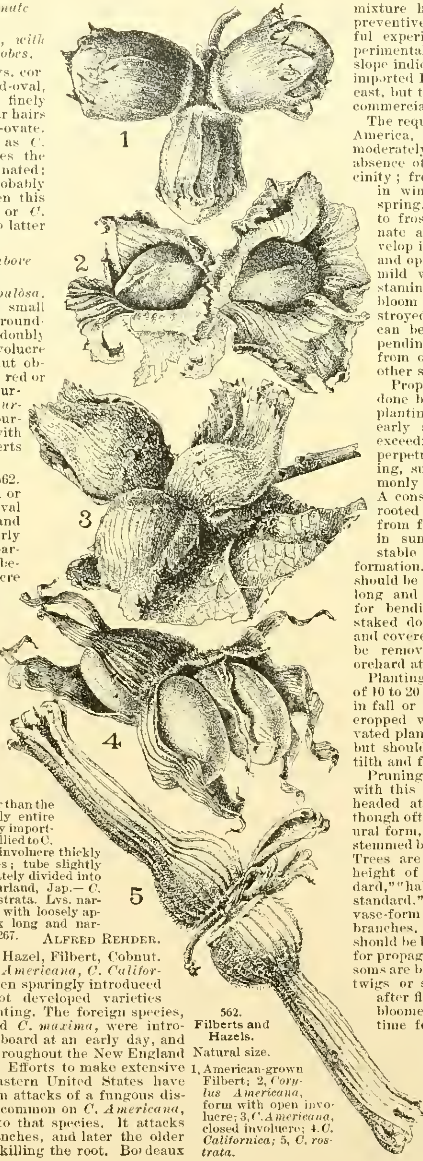
máxima, Mill. (*C. tubulòsa*, Willd.). Shrub, sometimes small tree, to 30 ft.: lvs. cordate, roundish-ovate, slightly lobed and doubly serrate, 3-6 in. long: involucre finely pubescent outside: nut oblong, large; kernel with thin red or white skin. S. Eu.—Var. **purpùrea,** Hort. (*C. Avellana purpurea*, Hort.). Lvs. deep purplish red. Many varieties, with large nuts, known as Filberts or Lambert's Filberts.

rostràta, Ait. Figs. 561, 562. Shrub, 2-6 ft.: lvs. rounded or slightly cordate at the base, oval or obovate, densely serrate and sometimes slightly lobed, nearly glabrous at length, except sparingly pubescent on the veins beneath, 2½-4 in. long: involucre densely beset with bristly hairs, beak long and narrow: nut ovoid, ½ in. long. Eastern N. Amer., west to Minn. and Colo. G.F. 8:345. B.B. 1: 508.

Califórnica, Rose. Fig 562. Allied to *C. rostrata*. Shrub, to 20 ft.: lvs. more villous beneath: involucre with a short beak, which is often flaring and sometimes torn.

C. heterophýlla, Fisch. Allied to C. Avellana. Lvs. more lobed: involucre large, spreading, longer than the fr., with large, triangular, nearly entire teeth. N. China, Jap. (Offered by importers.)—*C. Mandshúrica*, Maxim. Allied to C. rostrata. Lvs. large and broad: involucre thickly beset with strong brown bristles; tube slightly enlarged at the apex, and laciniately divided into narrow, entire segments. Amurland, Jap.—*C. Sièboldi*, Blume. Allied to C. rostrata. Lvs. narrower: involucre densely coated with loosely appressed, less bristly hairs; beak long and narrowed toward the end. A.G. 12:267.

ALFRED REHDER.



562. **Filberts and Hazels.** Natural size.

1, American-grown Filbert; 2, *Corylus Americana*, form with open involucre; 3, *C. Americana*, closed involucre; 4. *C. Californica*; 5, *C. rostrata.*

CULTURE FOR THE NUTS.—Hazel, Filbert, Cobnut. The three native Hazels, *C. Americana*, *C. Californica* and *C. rostrata*, have been sparingly introduced to cultivation, but have not developed varieties worthy of naming or propagating. The foreign species, *C. Avellana*, *C. Pontica* and *C. maxima*, were introduced along the Atlantic seaboard at an early day, and are maintained in gardens throughout the New England and Middle Atlantic states. Efforts to make extensive culture profitable in the eastern United States have hitherto failed, probably from attacks of a fungous disease, *Cryptospora anomala*, common on *C. Americana*, but not specially injurious to that species. It attacks and destroys the young branches, and later the older branches and trunk, without killing the root. Bordeaux mixture has been suggested as a preventive, but recorded successful experiments are lacking. Experimental plantings on the Pacific slope indicate greater success with imported Hazels there than in the east, but they have not developed commercial importance.

The requirements of the Hazel in America, so far as known, are: moderately rich, well-drained soil; absence of *C. Americana* from vicinity; freedom from mild periods in winter and late frosts in spring. It is specially subject to frost injury, as both staminate and pistillate catkins develop in fall and quickly swell and open under the influence of mild weather in winter. The staminate catkins commonly bloom first. If they are destroyed by frost, fertilization can be accomplished by suspending branches from trees from other localities, even of other species of Corylus.

Propagation by seeds is easily done by stratifying in fall and planting in nursery rows in early spring. Seedlings vary exceedingly, and varieties are perpetuated by budding, grafting, suckers or layers; commonly by the last two methods. A considerable supply of well rooted suckers can be obtained from fruiting trees by banking in summer with rich soil or stable manure to promote root formation. Stools for layering should be heavily manured to force long and slender shoots suitable for bending. These should be staked down in winter or spring and covered with earth. They may be removed to nursery rows or orchard at end of first season.

Planting should be at a distance of 10 to 20 feet in well prepared soil, in fall or spring. Ground may be cropped with low growing, cultivated plants while trees are young, but should be maintained in good tilth and fertility.

Pruning is of special importance with this nut. Trees are usually headed at height of 1 or 2 feet, though often permitted to take natural form, which is that of a many-stemmed bush, designated a "stool." Trees are classified according to height of clear trunk into "standard," "half standard," and "dwarf standard." A short trunk, with vase-form head of six or more branches, is preferred. Suckers should be kept down, unless desired for propagation. Both sexes of blossoms are borne on 1-year-old lateral twigs or spurs. March or April, after flowers of both sexes have bloomed, is considered best time for pruning, as unnecessary sacrifice of pollen can thus be avoided. Strong shoots should be headed back to promote spur formation, and old wood that has borne fruit should be removed annually.

The nuts should not be gathered until ripe, a condition indicated by the browning of the edges of the husk. If left until fully ripe, many of the nuts will rattle out and be lost. The highest prices are obtained for freshly gathered nuts in the husks. To prevent husks from molding, they should be well dried or slightly sulphured. Hazelnuts may be held for considerable periods in tight receptacles, as casks or jars, by sprinkling salt over them and storing them in a cool, dry place, or in a refrigerated compartment.

Few insects trouble the European Hazelnuts in America, the nut weevil of Europe, *Balaninus nucum*, not having yet been naturalized. *B. nasicus* sometimes does considerable injury to the native species.

Nuts and Filberts are terms loosely used abroad, especially in England, to designate certain rather indefinite forms of *C. Avellana* and *C. maxima*. In general, such varieties as have husks shorter than their fruits are termed Nuts, while such as have husks as long as or longer than their fruits are designated Filberts.

But few varieties are known in America, most of the Hazels grown being seedlings from imported nuts. Varieties of *C. Avellana* and *C. maxima* are not clearly distinguishable, but in general those with husks longer than the nuts are assigned to *C. maxima*, and those with short husks to *C. Avellana*.

Alba (White Filbert). Regarded in England as one of the best varieties. Can be kept in husk longer than most others because of constricted form of husk. Kernel covered with a white skin. Known as Avelinier Blanche, Wrotham Park, etc. Succeeds in California.

Cosford (Miss Young's, Thin-shelled). Nut oblong, thin-shelled, of excellent quality; in a hirsute, laciniated husk, about the same length as nut.

Crispa (Cape Nut, Frizzled Filbert). Nut thin-shelled, somewhat flattened, late; in husks curiously frizzled throughout and wide open at the mouth. Very productive.

Downton Large Square. Nut very large, semi-square, thick-shelled and well filled, of the highest quality; husk smooth, shorter than nut.

Du Chilly. A fine, large, compressed-cylindrical variety, with moderately thick shell, and of fine quality. Introduced from France by Felix Gillet, of California. The largest Filbert grown in America so far as known.

Grandis (Round Cobnut). Nut large, short, slightly compressed, of good quality when fresh, with a thick and hard shell; in a short husk, much frizzled and hairy. One of the best varieties; considered the true Barcelona nut of commerce. Also known as Downton, Dwarf Prolific, Great Cob, Pearson's Prolific and Round Cob.

Jones. A short, roundish nut, of mèdium size and good quality, somewhat grown for several years in central Delaware. Bush hardy and vigorous, producing suckers freely, and thus far free from disease.

Lambert (Lambert's Filbert, Lambert's Nut, Filbert Cob; Kentish Cob, erroneously). Nut large, oblong, somewhat compressed; shell rather thick; kernel plump and of rich flavor; an excellent keeper. Husk quite smooth, longer than nut and but slightly cut in margin. Tree productive. Considered the best variety grown in England, where it has been known since 1812.

Purple-leaved. Nut large and of excellent quality; in a husk longer than the fruit. Planted for ornament, and productive of good nuts under proper treatment. The leaves and husks are of a deep purple color, which is retained until frost. The staminate catkins are tender and often injured by frosts in winter, but when supplied with pollen from some more hardy variety it yields large crops.

Red Aveline (Avelineer Rouge, Red Hazel). Nut large, ovate, thin-shelled, with a smooth, red-skinned kernel, and of sweet nutty flavor. This variety is prized in eastern California as a productive sort of good quality.

Spanish. Nut very large, oblong, thick-shelled, with a smooth husk longer than the fruit. Sometimes confounded with Grandis.

W. A. Taylor.

CORYNÓSTYLIS (Greek, describing the club-shaped style). *Violàceæ.* Woody climbers, with alternate lvs. and racemes of long-stalked violet-like fls. **C. Hybánthus,** Mart. & Zucc. (*Calýptrion Aublètii*, Ging. *Corynóstylis Aublètii*, Hort.), is native of trop. America. The lvs. are large, ovate, serrate: fls. white, in short axillary fascicles, which are contiguous along the stem, long-spurred, 2 or 3 times as large as a violet. F.S. 21:2213. —A handsome, vigorous warmhouse climber, and cult. in the open in S. California. Prop. by cuttings and seeds.

CORỲPHA (Greek for *summit* or *top*,—where the lvs. grow). *Palmàceæ*, tribe *Corỳpheæ.* Tall, spineless, monocarpic palms: trunk stout, ringed: lvs. terminal, large, orbicular, flabellately divided to the middle into numerous linear-lanceolate segments; segments induplicate in the bud; rachis none; ligule small: petiole long, stout, concave above, spiny on the margins: sheaths split; spadix solitary, erect, paniculately much branched; spathes many, tubular, sheathing the peduncle and branches: fls. green: frs. as large as a cherry, with a fleshy pericarp. Species 6; tropical Asia and Malay Archipelago. These fan-palms are cultivated the same as Chamærops and Livistona. They are warmhouse plants, prop. by seeds. Large fans, umbrellas and tents are made of the Talipot palm by the natives of Ceylon.

Coryphas are but little grown commercially, the growth of young plants being slow. Good loam well enriched with stable manure, a night temperature of 65° and abundant moisture, are the chief requisites in their culture, with a moderately shaded house during the summer.

elàta, Roxb. (*C. Gebánga*, Blume). Trunk straight, 60–70 ft. high, 2 ft. in diam., spirally ridged: lvs. lunate, 8–10 ft. in diam.: segments 80–100, separated nearly to the middle, ensiform, obtuse or bifid: petioles 6–12 ft., with black margins and curved spines. Bengal and Burma.

umbraculifera, Linn. Talipot Palm. Fig. 563. Trunk annulate, 60–80 ft.: lvs. sub-lunate, 6 ft. long by 13 ft. wide, palmately pinnatifid, conduplicate above the middle: segments obtusely bifid: petiole 7 ft., the spines along its margins often in pairs. Malabar coast and Ceylon. A.F. 12:313. Gng. 5:213. The picture (Fig. 563) is adapted from Martius' Natural History of Palms.

563. Corypha umbraculifera.

C. austràlis, R. Br. See Livistona.—*C. macrophýlla*, Hort. =?—*C. minor*, Jacq. See Sabal.—*C. Wògani*, Hort., is a dwarf round-lvd. plant. A.G. 15:307.

Jared G. Smith. and W. H. Taplin.

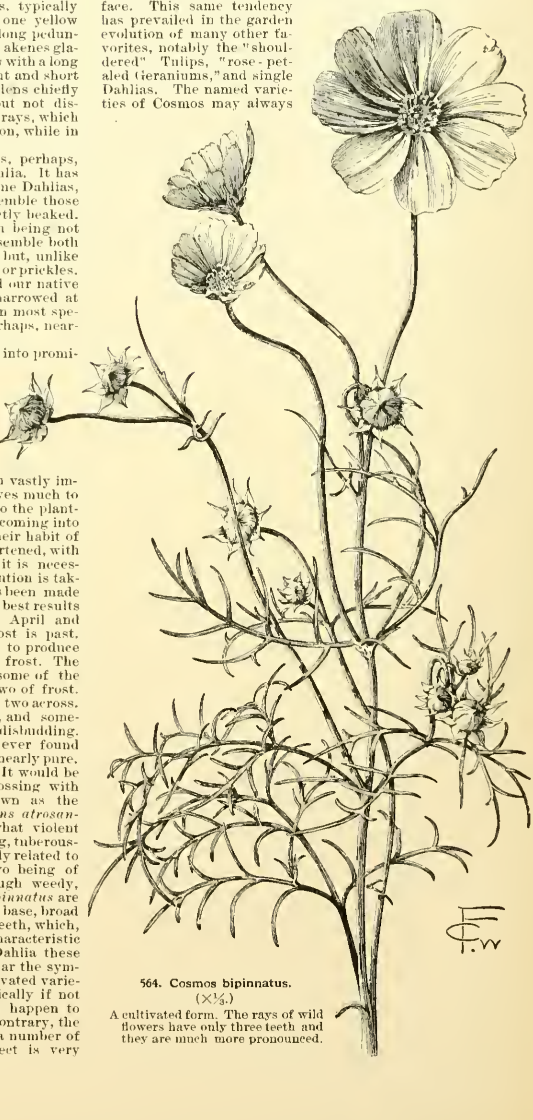
COSMÁNTHUS. All included in *Phacelia*.

COSMÍDIUM is *Thelesperma*.

CÓSMOS (from the Greek word with a root idea of orderliness; hence an ornament or beautiful thing, which fits the present case; finally and usually the universe, because of its orderliness). *Compósitæ.* A genus of at most 20 species of annual or perennial herbs, all tropical American, mostly Mexican, often tall, usually glabrous: lvs. opposite, pinnately cut in the garden kinds, in some others entire or lobed: fls. typically shades of rose, crimson and purple, with one yellow species, and white horticultural varieties, long peduncled, solitary or in a loose, corymbose panicle: akenes glabrous: chaff of the receptacle in *C. bipinnatus* with a long and slender apex, in other species with a blunt and short apex. The genus is distinguished from Bidens chiefly by the seeds, which are beaked in Cosmos but not distinctly so in Bidens, and by the color of the rays, which in Cosmos is typically some form of crimson, while in Bidens the rays are yellow or white.

The "Black Cosmos" (*C. diversifolius*) is, perhaps, better known to the trade as a Bidens or Dahlia. It has the dwarf habit and dark red early fls. of some Dahlias, but the akenes are very puzzling. They resemble those of Bidens in being 4-angled, and not distinctly beaked. They are unlike Bidens, and like Cosmos, in being not distinctly compressed on the back. They resemble both genera in having 2 rigid persistent awns, but, unlike these genera, the awns have no retrorse barbs or prickles. The akenes are linear, as in Cosmos and all our native tropical species of Bidens; but, although narrowed at the apex, they are not distinctly beaked, as in most species of the genus Cosmos. The plant is, perhaps, nearest to Bidens.

Among the garden annuals that have come into prominence in recent years, the Cosmos has a most brilliant future. Until 1895 there were in the two leading species only three strongly marked colors: white, pink and crimson. These and the less clearly defined intermediate shades have all come from *C. bipinnatus*; the yellow forms have come from *C. sulphureus*, which was introduced in 1896. Although Cosmos has been vastly improved within the last five years, it still leaves much to be desired and offers a most promising field to the plant-breeder. The two species are still too late in coming into bloom and too tall and weedy looking in their habit of growth, but the season is being gradually shortened, with dwarfer forms continually coming on, and it is necessary to be patient while this interesting evolution is taking place. The chief improvement so far has been made in California and in Georgia. In the east, for best results it is still necessary to sow seed indoors in April and transplant outdoors as soon as danger of frost is past. Seed sown in the open ground often fails to produce flowers in some northern localities before frost. The slightest frost kills the typical species, but some of the new strains are said to resist a degree or two of frost. At first Cosmos flowers were only an inch or two across. The best varieties now average 3 inches, and sometimes reach 4 and 5 without thinning or disbudding. Pure white flowers of Cosmos are rarely if ever found wild, but some of the cultivated varieties are nearly pure. The group is totally lacking in bright reds. It would be interesting to try for shades of red by crossing with the dark blood-red *C. diversifolius* (known as the Black Cosmos, *Dahlia Zimapani* and *Bidens atrosanguinea*), which, however, would be a somewhat violent cross, as that is a low-growing, early-flowering, tuberous-rooted perennial. However, Cosmos is closely related to Dahlia, Coreopsis, and Bidens, the first two being of great garden importance and the latter, though weedy, having possibilities. The rays of *Cosmos bipinnatus* are typically obcordate in outline, narrow at the base, broad at the apex and with three strongly marked teeth, which, as in Coreopsis, are a great part of the characteristic beauty of the flower. In the wild single Dahlia these teeth are so short that they serve only to mar the symmetry of outline, and in the high-bred, cultivated varieties of single Dahlias these teeth are practically if not wholly obliterated. This will perhaps never happen to the Cosmos, at least in America. On the contrary, the rays of the Cosmos sometimes have an extra number of teeth, often 6 or 7 altogether, and the effect is very attractive and individual. Moreover, these teeth are often somewhat wavy, giving the whole flower a frilled appearance. The wild Cosmos is a stellate flower; that is, it has open spaces between its rays. These rays in cultivation have broadened and rounded in outline and have overlapped, so that the new forms do not show any vacant spaces between the rays but present a solid unbroken face. This same tendency has prevailed in the garden evolution of many other favorites, notably the "shouldered" Tulips, "rose-petaled Geraniums," and single Dahlias. The named varieties of Cosmos may always



564. Cosmos bipinnatus. (×⅓.)

A cultivated form. The rays of wild flowers have only three teeth and they are much more pronounced.

be expected to have more symmetrical and perfectly formed flowers than the mixed and nameless varieties, much as the highest bred single Dahlias always have 8 rays all exactly alike, while it is a mark of Dahlias of low degree to have more than 8 rays or an unsymmetrical arrangement of them. A new feature, too, is the advent of a distinct ring of color formed by a dash of crimson at the base of each ray. The wild Cosmos is not troubled by a spot of yellow at the base of each ray, as is the wild Dahlia. In the case of the single Dahlia, the yellow color at the base of the ray never becomes definite and conspicuous enough to form an additional attractive feature, as it does in *Chrysanthemum carinatum*, but it often spoils the unity of effect and fails to harmonize with the chief color of the flower, especially when the latter is magenta, crimson, rose, or any allied shade. There are no full double forms of Cosmos as yet, and, as regards strongly marked types of doubling, the Cosmos may be decades behind the China Asters. In the single forms, flat, incurved or cupping, and reflexed flowers are to be looked for, and can be fixed if there is sufficient demand for maintenance of the three types.

It is a mistake to grow Cosmos in too rich soil, as one gets too vigorous growth and too few flowers, which are also late. A sandy soil is to be preferred as being earlier, and not too rich. It is well to pinch out the leading shoots of young plants in order to make them bushy and symmetrical, instead of tall and straggling. W. M.

Cosmos bipinnatus has many varieties as to shapes, and its colors run through white, "washed" or faded pinks, and reds. The plants grow 7–10 ft., and bloom in fall only. A dwarf variety of this species, and starting out with Dawn (white shaded to pink at center) has developed colors until it now includes white, pink and crimson. The plants are some 4½ ft. high, and bloom in July. The seed is only one-half the length of the typical *C. bipinnatus*. This selection was continued until double blooms were secured, but double blooms perfected no seed.

C. sulphureus is entirely distinct from the above, the foliage being broad and handsomely cut, whilst the flowers vary from sulfur-yellow of the typical species, to the rich orange-yellow of Klondyke, and a tall, late variety. *Cosmos sulphureus* shows an inferior bloom 1½ in. in diameter, rather meager foliage, and grows about 3 ft. high. The tall, late variety has fine, rich orange fls. 2½–3¼ in. in diameter, with very heavy, coarse and dense foliage, grows 7–12 ft. high, and blooms in Georgia after October 15. The Klondyke, a hybrid of my own from *Cosmos sulphureus*, and the tall, late-blooming variety, has rich orange-yellow blooms, 2½–3¼ in. in diameter, with foliage a happy medium between its two parents, grows 3½–4 ft. high, begins to bloom in Georgia from field-grown seed April 15, and by May 15 is a plant 2½ ft. tall, covered with blooms from base to top, which continue without cessation until killed by frost, when plant is 3½ ft. high and of the same spread. The culture of all varieties is simple, and only requires well-prepared soil, not too rich, early planting of seed, and the keeping of young plants free of weeds until they shade the ground. *C. bipinnatus* and the tall, late variety should be planted in rows 6 ft. apart and 4 ft. in a row.

The variety Dawn and its companions in white, pink and crimson, and Klondyke should be planted in 3-foot rows, 3 ft. apart. Neither of the above yellow varieties should be confounded with the worthless Bidens offered as *Cosmos sulphureus*. The earlier Cosmos seed is planted after danger of frost the better, as it germinates unsatisfactorily when the weather is warm. When cabbage seed can be sown in the field with safety, Cosmos can also be sown. Cult. by A. W. SMITH.

A. *Rays white, pink or crimson: disk yellow.*

bipinnàtus, Cav. Fig. 564. Glabrous annual 7–10 ft. high: lvs. bipinnately cut, lobes linear, remote, entire: involucral scales ovate-lanceolate, acuminate: fls. white, pink or crimson: seeds smooth, with an abrupt beak much shorter than the body. Mex. B.M.1535. Gn. 41:838. R.H. 1892:372.—The older and commoner species. *C. hybridus*, Hort., is presumably a trade name for mixed varieties of *C. bipinnatus*, but see G.F. 1:475.

AA. *Rays yellow: disk yellow.*

sulphùreus, Cav. Pubescent, 4–7 ft. high, much branched: lvs. often 1 ft. or more long, 2- or 3-pinnately cut, lobes lanceolate, mucronate, with rachis and midrib ciliate or hispid; pinnæ alternate, entire or 2–3-toothed: peduncles 7–10 in. long, naked: outer involucral bracts 8, linear, acuminate, green, 2 lines long; inner ones 8, oblong, obtuse, scarious, 5 lines long: fls. 2–3 in. across, pale, pure or golden yellow: rays 8, broadly obovate, strongly 3-toothed at the apex, ribbed beneath: anthers of the disk exserted, black, with orange tips: seeds linear, 1 in. long, including the slender beak. Mex. G.F. 8:485.—Int. 1896; parent of all yellow forms.

AAA. *Rays dark red: disk red.*

diversifòlius, Otto (*Bìdens atrosanguínea*, Ortg. *B. dahlioides*, S.Wats. *Dáhlia Zimapàni*, Roezl). BLACK COSMOS. Tender annual, 12–16 in. high, with tubers more slender, and requiring more care in winter, than those of common Dahlias: lvs. pinnately parted; lfts. 5-7, entire or slightly serrate, the terminal lfts. largest: peduncles each bearing 1 head 6 in. or more above foliage: rays dark velvety red, sometimes tinged dark purple. Mex. B.M. 5227. Gt. 1861:347. F.C. 2:47. J.H. III. 33:403. Var. **supérba**, Hort., is sold.—Prop. almost exclusively by seeds. W. M.

COSTMARY. The rayless form of *Chrysanthemum Balsamita*, known as var. *tanacetoides*.

CÓSTUS (old classical name). *Scitaminàceæ*. SPIRAL FLAG. About 30 perennial thick-rooted herbs, in the tropics of America, Africa, Asia and Australia, cult. for their flowing-limbed showy fls., which are in terminal, bracteate spikes. Corolla tubular, equally cleft, not showy: one staminodium, enlarged and bell-shaped, usually with a crispy limb, and forming the showy part of the flower (called the lip), cleft down the back: ovary 3-loculed: filaments petaloid. More or less fleshy plants, prized in warmhouses, and grown in the open in S. Fla.

This interesting genus of tropical herbs thrives in any rich, moist soil, but luxuriates in that of a gravelly or sandy character, when under partial shade. The plants are readily propagated by cutting the canes, or stalks, into short pieces of an inch or two in length, and planting in sifted peat, or fine moss and sand, covering but lightly. The roots may also be divided, but this is a slow means of propagation. Specimen plants require rather high temperature to bring out the rich colors of the leaves, which in some species are prettily marked with a purplish tint, and are usually arranged spirally on the ascending stem. This gives rise to the name, "Spiral Flag."

A. *Leaves green and plain.*

B. *Flower white.*

speciòsus, Smith. Four–5 ft., stout, erect: lvs. ovate or lance-ovate, nearly 1 ft. long, silky beneath: bracts red: fl. large, with a flowing white limb and pink center, 3–4 in. across, not lasting. E. Ind. I.H. 43:56. Gn. 47:1004.

BB. *Flower red.*

igneus, N. E. Brown. One–3 ft.: lvs. elliptic-lanceolate, 4–6 in. long: bracts not colored nor conspicuous: fls. clustered, orange-red. Brazil. I.H.31:511. B.M.6821. J.H. III. 28:11.

AA. *Leaves party-colored.*

musàicus, Hort. Lvs. obliquely lanceolate, 4–5 in. long, dark green, marked and tessellated with silvery gray. W. Africa.—*C. zebrina* is very likely the same.

E. N. REASONER and L. H. B.

CÓTINUS. A section of *Rhus*.

COTONEÁSTER (*cotoneum*, quince, and *aster*, similar; the lvs. of some species resemble those of the Quince). *Rosàceæ*, subfamily *Pòmeæ*. Shrubs, rarely small trees: lvs. alternate, deciduous or persistent, short-petioled, entire, stipulate: fls. solitary or in cymes, terminal, on short lateral branchlets, white or pinkish; petals 5; stamens about 20: fr. a black or red pomaceous drupe, with 2–5 stones. About 25 species, in the temperate regions of Europe and Asia, also in N. Africa, but none in Japan. Ornamental shrubs, many of them with decorative frs., remaining usually through the whole winter, while only a few, like the hardy *C. multiflora* and the tender *C. frigida*, are conspicuous with abundant white fls. Of the species with decorative red frs., *C. tomentosa*, *C. nummularia* and *C. vulgaris* are quite hardy, and *C. Simonsi*, *C. acuminata*, *C. rotundifolia*, *C. microphylla* and others are hardy at least as far north as New York, while *C. frigida* and its allies are the most tender. The half-evergreen or evergreen *C. horizontalis* and *C. microphylla*, with its allied species, are well adapted for rockeries on account of their low almost horizontal growth. Cotoneasters thrive in any good, well-drained garden soil, but dislike very moist and shady positions. Prop. by seeds, sown in fall or stratified; the evergreen species grow readily from cuttings of half-ripened wood in August under glass; increased also by layers, put down in fall, or by grafting on *C. vulgaris*, hawthorn, mountain ash or quince. Monogr. by H. Zabel, Mitteil. Deutsch. Dendrol. Gesellsch., 1897:14–32; 1898:37–38.

A. *Foliage deciduous or semi-persistent: fls. usually in cymes.*

B. *Fls. with erect petals, usually in few-fld. cymes.*

C. *Lvs. whitish tomentose beneath, deciduous.*

vulgàris, Lindl. (*C. integérrima*, Med.). Shrub, to 4 ft.: lvs. ovate or oval, acute or obtuse and mucronulate, glabrous and dark green above, whitish and at length greenish tomentose beneath, ¾–2 in. long: cymes nodding, 2–4-fld.: fls. pale pinkish; calyx glabrous outside: fr. globular, bright red. May, June. Europe, W. Asia, Siberia.

tomentòsa, Lindl. Shrub, to 6 ft.: lvs. broadly oval, obtuse, dull green above and pubescent when young, whitish tomentose beneath, 1–2½ in. long: fls. 3–12, white; calyx tomentose outside: fr. bright brick-red. June. Eu., W. Asia.—Sometimes cult. as *C. speciosa*, Hort.

CC. *Lvs. green beneath, with appressed hairs, semi-persistent or nearly so: calyx appressed-hairy outside.*

acuminàta, Lindl. Erect shrub, to 6 ft.: lvs. oblong to ovate-oblong, acute, appressed-hairy on both sides, dull above, 1½–3 in. long: cymes 2–5-fld., nodding: fls. white or slightly pinkish: fr. deep red, oblong. June. Himalayas. L.B.C. 10:919 (as *Mespilus*). R.H. 1889:348, Fig. 5 (as *C. Nepalensis*).

Simonsi, Bak. Shrub, with spreading branches, to 4 ft.: lvs. roundish oval, acute, glabrous above, ½–1 in. long, semipersistent: cymes 2–5-fld.: fls. white, slightly pinkish: fr. bright red. June, July. Himalayas.—One of the best red-fruiting species, often under the name *C. Simondsii* or *Symonsi*.

horizontàlis, Dcne. Low shrub; branches almost horizontal and densely distichously branched: lvs. round-oval, acute at both ends, glabrous above, sparingly setosely hairy beneath, ⅛–⅜ in. long: fls. erect, 1–2, pink: fr. oblong, bright red. June. China. R.H. 1889:348, Fig. 1.—One of the most effective fruiting shrubs for rockeries.

BB. *Fls. with spreading petals, in erect, usually many-fld. cymes, white.*

C. *Lvs. obtuse or acute, ½–1½ in. long, deciduous.*

nummulària, Fisch. & Mey. Shrub, to 4 ft., with erect or spreading branches, rarely prostrate: lvs. roundish or broad ovate, whitish or grayish tomentose beneath, glabrous above: cymes very short-peduncled, 3–12-fld.: peduncle and calyx tomentose: fr. red. May, June. From N. Africa and W. Asia to Himalayas and Turkestan.—Var. **racemiflòra**, Wenz. (*C. Fontanèsi*, Spach). Lvs. acute at both ends: cymes 5–12-fld. R.H. 1867:31. Very decorative and hardy. Var. **orbiculàris**, Wenz. Low and divaricate: lvs. roundish or obovate, ½–¾ in. long: cymes 3–6-fld.

multiflòra, Bunge (*C. refléxa*, Carr.). Shrub, to 6 ft., with usually slender, arching branches: lvs. broad ovate, usually acute, slightly tomentose beneath, soon becoming glabrous: cymes very numerous, 6–20-fld.: calyx and peduncles glabrous: fr. red. May. Spain, W. Asia to Himalayas and China. R.H. 1892, p. 327.—Very decorative in bloom, and hardy, but less free fruiting.

CC. *Lvs. acute, 2–5 in. long, semipersistent.*

frígida, Wall. Large shrub, to 20 ft.: lvs. oblong, acute at both ends, glabrous above, tomentose beneath when young: cymes long-peduncled, very many-fld., pubescent: fr. scarlet. April, May. Himalayas. B.R. 15:1229. L.B.C. 16:1512.—One of the most beautiful in fl. and fr., but not hardy north.

AA. *Foliage persistent, small, ¼–¾ in., revolute at the margin: fls. 1–3, with spreading petals, white.*

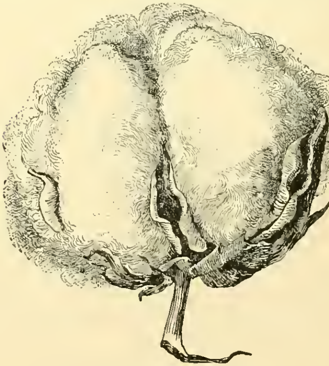
microphýlla, Wall. Low, prostrate shrub, densely branched: lvs. cuneate oblong or obovate, acute, shining above, densely pubescent beneath: fls. usually solitary; calyx pubescent: fr. bright red. May, June. Himalayas. B.R. 13:1114. L.B.C. 14:1374. R.H. 1889:348, Fig. 3.

buxifòlia, Wall. Low shrub, similar to the former: lvs. elliptic-ovate or broad oval, acute, dull and sometimes pubescent above, tomentose beneath, ⅓–½ in. long: cymes 1–3-fld.: calyx pubescent: fr. bright red. Himalayas. R.H. 1889:348, Fig. 4.

C. acutifòlia, Lindl. Allied to C. acuminata. Lvs. oval, acute, glabrous and somewhat shining above: fr. black. Dahuria to N. China. Hardy.—*C. affìnis*, Lindl. Allied to C. frigida. Lvs. broad-elliptic: fr. dark brown, globose. L.B.C. 16:1522.—*C. angustifòlia*, Franch. Low, often spiny: lvs. linear-lanceolate, tomentose beneath, persistent. Yunnan.—*C. arboréscens*, Zab., not Wenz. Allied to C. nummularia. Fr. black. Himalayas.—*C. bacillàris*, Wall. Allied to C. frigida. Lvs. smaller, usually glabrous beneath at length: fr. dark brown. Himalayas.—*C. laxiflòra*, Jacq.=C. nigra, var. laxiflora.—*C. melanocárpa*, Lodd. =C. nigra.—*C. nìgra*, Wahlenb. Allied to C. vulgaris. Cymes erect, 2–10-fld.: fr. black. Europe, Siberia. L.B.C. 16:1531.—Var. *laxiflòra*, Koehne. Cymes many-fld., nodding. B.M. 3519. B.R. 14:1305. Hardy.—*C. pannòsa*, Franch. Three ft.: lvs. oval-lanceolate or elliptic, whitish beneath, persistent: fr. red. Yunnan.—*C. Pekinènsis*, Zab. Allied to C. acuminata. Lvs. dull and sparingly hairy above: calyx densely pubescent: fr. black. N. China.—*C. Pyracántha*, Spach=Pyracantha coccinea.—*C. rotundifòlia*, Wall. (C. microphylla, var. Uva-ursi, Lindl.). Allied to C. buxifolia, but of more upright growth. Lvs. nearly orbicular, appressed-hairy beneath: fls. 1–3; calyx glabrous: fr. red. Himalayas. B.R. 14:1187.—*C. Sinènsis*, Hort.=C. acutifolia.—*C. thymifòlia*, Bak. Allied to C. microphylla. Lvs. cuneate, linear-oblong, obtuse. R.H. 1889:348, Fig. 2.—*C. uniflòra*, Bunge. Allied to C. vulgaris. Lvs. glabrous: fls. solitory: fr. red. Songaria.—*C. Wheèleri*, Hort.=C. buxifolia, or C. nummularia, var. orbicularis.

ALFRED REHDER.

COTTON belongs to the genus Gossypium (name used by Pliny), of the *Malvàceæ*. The species are now much confused, but it is generaly agreed that the Sea Island Cotton is of the species *G. Barbadénse*, Linn. The upland Cotton is probably derived chiefly or wholly from *G. herbàceum*, Linn. The former is native in the West Indies. The nativity of the latter is in dispute, but it is probably Asian. The Cotton flower is mallow-like, with a subtending involucre of 3 large heart-shaped bracts.



565. A Cotton boll.

The carpels or cells of the pod are 3–5. These carpels break open, and the cotton covering of the seeds makes a globular mass,—the Cotton boll (Fig. 565). Cotton is not a horticultural crop, and is therefore not considered in this work. The reader will find "The Cotton Plant" (published by the Dept. of Agr., Bull. 33), a useful monograph.

COTTONWOOD. Species of *Populus*.

COTYLÈDON (a name used by Pliny). *Crassulàceæ.* Includes *Echevèria.* Succulent herbs or shrubs, rarely annual: branches and leaves thick and fleshy: lvs. opposite or alternate, petiolate or sessile: calyx 5-parted, as long as or shorter than the corolla tube; petals 5, erect or spreading, connate to the middle, longer than the 10 stamens. Differs from Sedum in the connate petals. Species 60 or more. Calif. and Mex., Afr., As. and Eu. See I.H. 10:76 for an account of many of the species.

Large-growing Cotyledons, such as *C. gibbiflora*, var. *metallica*, should be increased by cuttings taken after the bedding season is over. The best method is to cut off the top of the plant, dress the bottom part, and place the cuttings in empty 4-inch pots, the bottom leaves resting on the rim of the pot until the cut heals over and a few small roots are formed. They may then be potted off into suitably sized pots, using sandy loam. No water will be needed for several days, and when given it must be only sparingly. The old stems should be placed rather close together in shallow boxes and kept in a warm, dry place, where they will form small growths along the stems; these, when large enough, may be put into boxes of dry sand, and potted in thumb- or 3-inch pots when they have made a sufficient quantity of roots. When it is desired to increase the low-growing bedding kinds on a larger scale, the plants should be lifted before the ground gets too wet and cold. They may either be boxed in dry soil and kept in a cool, dry house, or placed thickly together in a frame, taking care that no drip is allowed on the plants, and giving no water. The most convenient time for propagation by leaves is during the months of November and December, when the fall work of rooting soft-wooded plants is over. Leaves rooted at this time will make plants large enough for planting out the following season. They will take from three to four weeks to root, according to the kind. The leaves must be taken from the plant as follows: Grasp each leaf between the thumb and forefinger, give a gentle twist first to one side then to the other until the leaf comes off, taking care that the dormant bud in the axil of the leaf accompanies it, otherwise the leaf will root but a plant will not form from it. Make a depression about two inches deep in the center and four inches wide across the sand bed, in this lay two rows of leaves with their bases touching each at the bottom of the depression; give no water until the small roots make their appearance, and only slightly afterwards. When the little plants are large enough they should be boxed, using sandy loam, and kept in a temperature of not less than 60°F at night.

For bedding purposes the following have been employed very successfully: *C. atropurpurea, Californica, clavifolia, coccinea, fascicularis, gibbiflora* var. *metallica, Pachyphytum, Peacockii, rosea, secunda, secunda* var. *glauca, imbricata, Mexicana, eximia, globosa, globosa* var. *extensa, Scheideckerii, mucronata, mirabilis, parvifolia.* Some of these are not offered in the American trade. Several of the kinds make very ornamental winter flowering plants; among them are *C. gibbiflora* and its forms, *C. fulgens* and *C. coccinea.* For this purpose the large plants should be lifted from the beds and carefully potted, as they make a much finer growth in the open ground than when grown in pots.

Cult. by G. W. Oliver.

A. *Lvs. crowded in a rosette at the base of the stem.*

B. *Fls. white, tinged with green.*

édulis, Brewer (*Sèdum édule,* Nutt.). Stems cespitose, very short and thick: lvs. cylindrical or obtusely 3-sided, 3–4 in. long, erect, whitish or glaucous-green, not mealy: fls. white, resembling those of Sedum, ½ in. in diam., short-pedicelled, along the upper sides of the flexuous branches of the cymose panicle; scape 1 ft. high. San Diego, Calif.—Int. 1883.

BB. *Fls. pale yellow.*

Califórnica, Baker (*C. láxa,* B. & H.). Lvs. in a rosette, concave, ligulate, lanceolate, acute, glaucous, mealy, slightly yellowish, 8 in. long: fls. pale yellow, on weak lateral flowering stems 1–2 ft. long, with short, ovate, clasping lvs. or bracts and bi- or trifid racemes. Calif.

BBB. *Fls. pale flesh color.*

pulverulénta, Baker (*Echevèria pulverulénta,* Nutt.). Lvs. in a rosette, silvery green, very mealy, spatulate, acute, the tips reflexed, the cauline lvs. gradually diminishing into broadly cordate, clasping bracts: panicles dichotomously branched; pedicels slightly longer than the pale flesh-colored fls. Plants 1 ft. in diam. S. Calif. F.S. 19:1927, 1928.—A fine plant for carpet-bedding.

566. A species of Cotyledon.

BBBB. *Fls. red and green or red and yellow.*

secúnda, Baker (*Echevèria secúnda,* Booth). Stemless: lvs. in a rosette, crowded, cuneiform, mucronate, glaucous, curving upward: fls. in a 1-sided, recurved spike, reddish yellow: peduncle long, 6–12 in. high. June–Aug. Mex.—Fine for borders or carpet-bedding. There is a var. *glaùca,* Hort.

lanceolàta, B. & H. (*Echevèria lanceolàta,* Nutt.). Lvs. in a rosette, lanceolate, acuminate, slightly mealy; stem-lvs. or bracts small, cordate, clasping, distant: panicle narrow, dichotomous: fls. red and yellow. Calif.

Bárheyi, Schw. Whole plant hoary-white: lvs thick, fleshy, shovel-shaped: fls. olive-green and red. Flowers freely in spring and summer. Abyssinia. Gt. 45, p. 465.—An exquisite plant for carpet-bedding.

AA. *Lvs. scattered along the erect or branching stems.*

fasciculàris, Soland. Smooth, 1–2 ft. high: lvs. pale greenish white with a yellowish margin, glaucous, few, sessile, cuneate-obovate, thick, flattened, slightly concave, cuspidate; panicle branches long, scorpioid: fls. large, 1 in. long, pendent; calyx lobes short, broadly ovate-acute; corolla tube much longer than the calyx, yellow-green and dull red; corolla-lobes reflexed. S. Afr. B.M. 5602. J.H. III. 29:443.

orbiculàta, Linn. Plant erect, 2–4 ft. high: lvs. opposite, flat, obovate-spatulate, obtuse, mucronate, glaucous and mealy, with red margins: fls. large, reddish, panicled. Fls. June–Sept. S. Afr. B.M. 321. R.H. 1857, p. 347.—Grows well from cuttings.

Hispánica, Linn. (*Pistorinia Hispánica*, DC.). Annual or biennial, branched, 6 in. high, erect: lvs. small, nearly cylindrical, oblong, few, sessile: fls. erect, in cymes, reddish; corolla trumpet-shaped, lobes spreading. Spain, Morocco. R.H. 1895, p. 472.

AAA. *Lvs. crowded at the ends of the branches.*

reticulàta, Thunb. Stems much-branched, fleshy: lvs. few at the ends of the branches, cylindrical, acute, erect, fleshy, soft, smooth: fls. in an erect, dichotomous panicle. The wiry fl.-stalks remain on the plant and give it the appearance of being enclosed in a network. G.C. III. 21:282.

gibbiflòra, Moc. (*Echevèria gibbiflòra*, DC.). Stems 1–2 ft. high: lvs. flat, wedge-shaped, acutely mucronate, crowded at the ends of the branches: fls. short-petioled: panicle branches 1-sided, spreading; corolla gibbous at the base between the calyx lobes, the tube white, the tips touched with crimson. Mex. B.R. 1247.

Var. **metállica,** Hort. (*Echevèria metallica*, Hort.). Lvs. large, obovate-spatulate, 6 in. wide by 7 in. long, a beautiful glaucous purple with metallic reflections: fls. yellowish with red tips. Mex. Saunders' Ref. Bot. 65.—An excellent bedding plant.

The following are doubtful species: *Echeveria Mexicàna*, Hort. Stems 8–12 in. high: fls. pink and yellow. Blooms in Tex. all winter. Beautiful for borders.—*Echeveria supérba*, Hort. Annual, with yellow fls., used for carpet-bedding.

C. atropurpùrea, Baker (E. sanguinea, Hort.), and *C. retùsa*, Baker, have been catalogued in this country. The former has red fls. and dark purple spotted lvs.; the latter has yellowish fls. and glaucous green more or less retuse lvs.

JARED G. SMITH.

COUCH GRASS. *Agropyrum repens.*

COVER-CROPS. The use of Cover-crops in orcharding marks a specific advance brought about by changed soil conditions. The term is less than 10 years old, having been first applied in this connection by Bailey, in Bulletin 61, Cornell (N. Y.) Experiment Station, p. 333, December, 1893, though Cover-crops were used previous to that date. In the early days of orcharding in this country, the soil, rich in humus and undepleted of its natural resources, gave satisfactory crops of fruit with trees growing in sod. As time went on, the waning vigor of the trees was stimulated by breaking up the sod, adding barnyard manure to the soil and giving thorough cultivation throughout the season. This system gave unsatisfactory results in many instances, particularly in the north, as it appeared to prevent the trees from ripening their wood sufficiently to enable them to endure the winters without frost-injury to the tips; root-killing was also noted as being occasionally severe on soils uncovered with vegetation during the winter. About this time the value of the members of the pea and bean tribe, as enrichers of the soil, became recognized more fully than formerly through the discovery of the nitrogen-collecting agents housed in the nodules borne by the roots of legumes. The best orchard practice of the present day, whether in the peach-growing areas of the south or the apple districts of the north, consists in giving the most thorough cultivation possible during the wood-producing period of the year,—that is, till about the time the fruit trees' terminal buds are formed,—then seeding this thoroughly pulverized surface with a suitable Cover-crop, which is plowed under early the following spring.

Cover-cropping is the raising of a crop in the orchard after cultivation should cease (about midsummer), that will protect the roots of the trees by preventing alternate freezing and thawing and deep freezing of the ground; that will add something to the fertility of the soil when turned under in spring; that will improve the physical condition of the soil; that will occupy the ground to the exclusion of weeds. In the south the considerations are practically identical, except that the contingency of root injury from frost is not weighed.

There are two classes of Cover-crops: the nitrogenous and the non-nitrogenous. Of the latter, rye, buckwheat, oats, millet, corn (maize), rape and turnips are principally used. These plants should be sown much later in the season than the clovers, cowpeas or most nitrogenous covers. They are valuable where the soil is hard and tough in texture, as advance agents of the legumes which may be used when an improved physical condition is secured. Buckwheat is particularly useful in ameliorating hard soils. It should not be sown early enough to allow seed to form before frost. These add comparatively little nitrogen to the soil. Among nitrogenous Cover-crops, crimson clover, red clover, cowpeas, soy beans, field pea, and vetch are the most prominent. In the south, crimson clover and cowpea (of which there are many varieties) are much in vogue. Cowpeas are unsatisfactory, however, north of the peach belt, owing to their sensitiveness to light autumn frosts. In apple-growing sections where the soil is mellow, red clover does well. A mixture of crimson clover and oats is used in peach sections in Michigan with success; 12 quarts of the former to 3 pecks of the latter per acre are sown about the middle of August. The Geneva Experiment Station recommends a mixture of ½ bushel of buckwheat to 1 bushel of field peas per acre for clay soils.

The question of what Cover-crops to use is best determined by an examination of the character of the soil, and the condition of the orchard trees. If the trees are growing slowly on mellow and friable soil, it will probably be advisable to use a nitrogenous Cover-crop. If, on the other hand, the trees are making a luxuriant growth, and the soil is of the heavy order, a member of the non-nitrogenous group should be tried.

Kinds of Cover-crops.

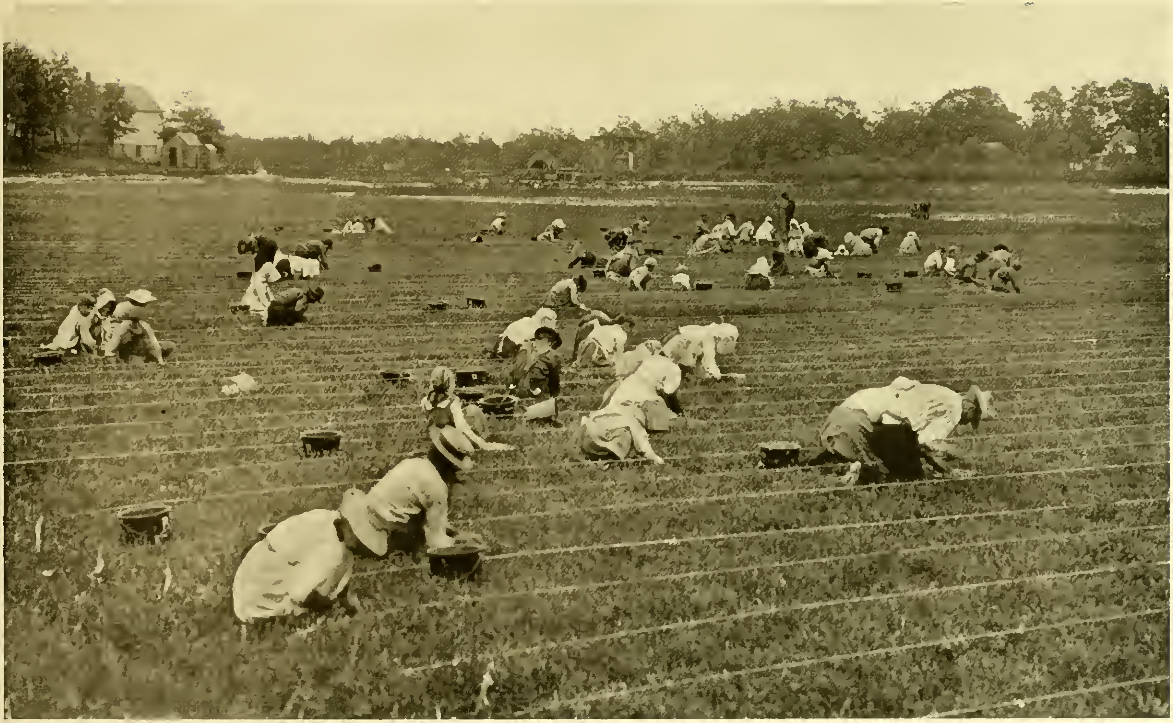
1. Non-nitrogenous—
    - *a.* Rye, two bushels per acre.
    - *b.* Buckwheat, ½ bushel per acre.
    - *c.* Oats, 2½ bushels per acre.
    - *d.* Corn, broadcast 1 bushel per acre.
    - *e.* Rape or turnips, 3 pounds per acre.
2. Nitrogenous—
    - *a.* Crimson clover, 16 pounds per acre.
    - *b.* Red clover, 14 pounds per acre.
    - *c.* Sand vetch, 1½ bushels per acre.
    - *d.* Soy beans, 2 bushels per acre.
    - *e.* Cowpeas, 2 bushels per acre.
    - *f.* Field peas, 1½ bushels per acre.
3. Mixtures of Nos. 1 and 2—
    - *a.* Buckwheat, 1½ bushels per acre.
      Field peas, 1 bushel per acre.
    - *b.* Crimson clover, 12 pounds per acre.
      Oats, three pecks per acre.
    - *c.* Oats, 1 bushel per acre.
      Vetch, 1 bushel per acre.

JOHN CRAIG.

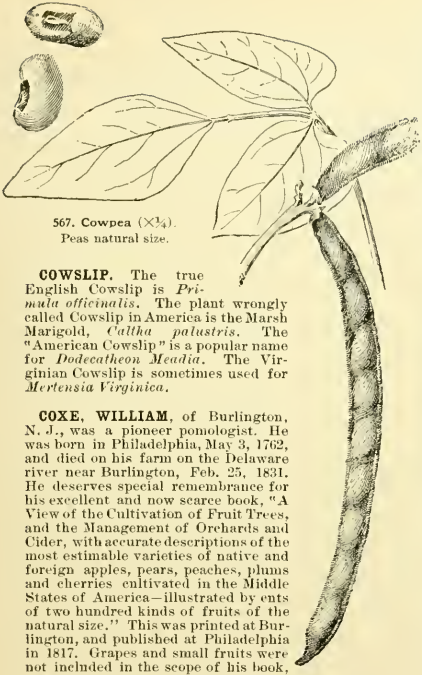
COWBERRY. Usually means *Vaccinium Vitis-Idæa.* In parts of Scotland, *Comarum palustre.*

COW-HERB. *Saponaria Vaccaria;* not cult.

COWPEA. Fig. 567. The American name for **Vígna Cátjang,** Walp. (*V. Sinénsis* Endl.), one of the Leguminosæ allied to Dolichos and Phaseolus. From Phaseolus (the common bean), Vigna differs in not having a spiral keel, style hairy above, stigma oblique or introrse, and other minor technical characters. In other than American literature, the Cowpea is known as China Bean and Black-Eyed bean. In the S. it is commonly known as Black Pea. Botanically it is a bean rather than a pea. The Cowpea is a rambling, tender annual, native to China and Japan. In this country it is extensively grown in the southern states, as a hay crop. It is also invaluable as a green-manure crop (see *Cover-crop*). It is to the south what clover is to the north and Alfalfa is to the west. It is sown broadcast after the manner of field peas. From 3 to 5 pecks of seed are used per acre. See Cowpeas, Farmers' Bull. 89, Dept. of Agric., by Jared G. Smith. L. H. B.



Picking Cranberries on Eastern Long Island



567. Cowpea (×¼).
Peas natural size.

COWSLIP. The true English Cowslip is *Primula officinalis*. The plant wrongly called Cowslip in America is the Marsh Marigold, *Caltha palustris*. The "American Cowslip" is a popular name for *Dodecatheon Meadia*. The Virginian Cowslip is sometimes used for *Mertensia Virginica*.

COXE, WILLIAM, of Burlington, N. J., was a pioneer pomologist. He was born in Philadelphia, May 3, 1762, and died on his farm on the Delaware river near Burlington, Feb. 25, 1831. He deserves special remembrance for his excellent and now scarce book, "A View of the Cultivation of Fruit Trees, and the Management of Orchards and Cider, with accurate descriptions of the most estimable varieties of native and foreign apples, pears, peaches, plums and cherries cultivated in the Middle States of America—illustrated by cuts of two hundred kinds of fruits of the natural size." This was printed at Burlington, and published at Philadelphia in 1817. Grapes and small fruits were not included in the scope of his book, but an article of his in the American Farmer for July, 1828, shows that he was acquainted with many varieties of grapes, and had done much grafting. His book was a standard until the time of the Downings, and was freely used by other authors. The illustrations were excellent for their time, but show only the size and outline of a fruit, and whether it was dotted, splashed or streaked.

Coxe said, 1817, that he had been "for many years actively engaged in the rearing, planting and cultivating of fruit trees on a scale more extensive than has been attempted by any other individual of this county." He also had a national reputation for his cider at an age when it was the most famous and characteristic beverage of the people, and when apple trees were cultivated more for cider than for a table fruit.

William Coxe belonged to one of the most refined families of Philadelphia. His early education was somewhat meager by reason of the Revolutionary war, but he became a cultured gentleman. John Jay Smith gives this pleasant picture of him: "Well do we remember his extensive library in his fine mansion on the 'Bank' at Burlington, when as a little boy we were assigned the duty of bringing away, or taking home, some book or pamphlet from his ever open stores of information. * * * His person was handsome, and his bearing that of the 'old-fashioned' gentleman, improved by mixing in the best society, but retaining the forms of the greatest politeness and suavity, that modern usages are too rapidly casting off. An errand to Mr. Coxe's was a cherished privilege; never was the opportunity neglected by him to place in the hand of his visitor some fruit that he so well knew would be appreciated by a youthful appetite. The finest Seckel pears we have ever seen were not unfrequent deposits. He had an especial fondness for the Seckel pear, which is certainly among the half dozen most famous pears of American origin, and which was pronounced by Downing to be the finest flavored of all pears." Coxe was made an honorary member of the Horticultural Society of London for making known the merits of this pear through Dr. Hosack. The city of Burlington has exceptional interest, both natural and historical, and has a beauty of its own. Either the first willow or the first poplar planted there is said to have been brought from Halifax in the hand of William Coxe. He planted many trees to beautify the town and, in particular, extended the front of the "Green Bank." It is pleasant to think of William Coxe in connection with the willow-fringed bank of the Delaware. Biographical details are unfortunately only too meager. A few other details may be gleaned from the Horticulturist, 11:304-307 (1856). W. M.

CRAB'S-EYE VINE. See *Abrus*.

CRAB-APPLE in its widest sense means a small apple. The Crab-apples of history are fruits of *Pyrus baccata*. For more restricted uses of the word crab, see *Pyrus*.

CRAB-GRASS. One of several names for *Eleusine Indica;* also for certain Panicums, as *P. sanguinale*.

CRÁMBE (old Greek substantive). *Cruciferæ*. Perennial hardy herbs, with small white, fragrant fls. in panicled racemes: lvs. mostly thick and large, more or less cut or lyrate. Of easy culture. Little known in this country. **C. maritima**, Linn., is the Sea Kale (which see). **C. cordifòlia**, Stev., of the Caucasian region, is cult. as a border plant. It is an excellent foliage plant, withstanding the winters in the northern states. Lvs. very large and heavy, cordate and ovate, toothed, glabrous or nearly so: fls. small but very numerous, in great branchy panicles 5–7 ft. high and nearly as broad. Gn. 50, p. 349. Gng. 4:291.—For the first two years from seed the plant makes only lvs.; but the third year it may be expected to bloom, after which the plant usually becomes weak and dies. L. H. B.

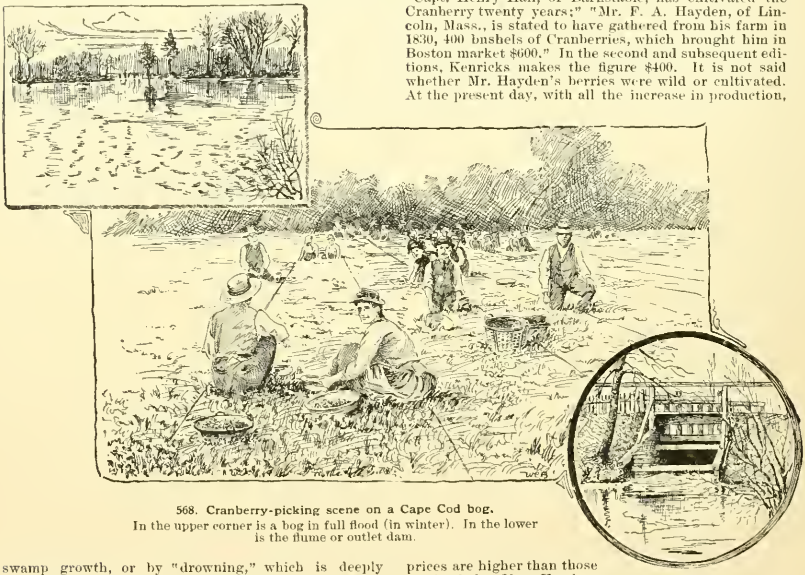
CRANBERRY. A name applied to trailing species of the genus Vaccinium (*Ericàceæ*). Of the true Cranberries there are two species in North America,—the small (*Vaccinium Oxycoccus*), and the large (*V. macrocarpon*). These are native to swamps, where they trail their slender stems and little oval evergreen leaves over the sphagnum and boggy turf. The red, firm berries ripen late in fall, and often persist on the vines until spring, when well protected with snow. Each berry is borne on a slender pedicel; and the curve of this pedicel in the European species is said to have suggested the name Craneberry, which is now shortened to Cranberry. See *Vaccinium*.

The large Cranberry, *Vaccinium macrocarpon*, is now cultivated on hundreds of acres in the United States; and this Cranberry culture is one of the most special and interesting of all pomological pursuits. This Cranberry grows only in North America; and North America is the only country which has a domestic or cultivated Cranberry. Because Cranberry-growing is such an unusual type of horticulture, it is thought advisable to devote considerable space to it in this Cyclopedia.

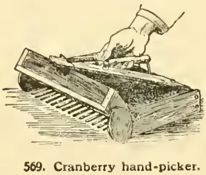
Cranberries may be grown on land both low and high; but it is the general experience that low, boggy lands are the only ones which give permanently good results. In the winter, the natural Cranberry bogs are usually flooded, and in summer they are free of standing water. The flowers are often caught by the late frosts of spring, and the fruit may be injured by the early frosts of fall. Bogs are often ruined by fire in times of drought. Insects and fungi often play havoc with the crop.

The ideal bog for Cranberry culture is the one in which the natural environments of the plant are most nearly imitated, and in which the grower can have the greatest control over the difficulties mentioned above. It should have the following qualifications: (1) Capability of being drained of all surface water, so that free water does not stand higher than one foot below the surface in the growing season. (2) Soil which retains moisture through the summer, for Cranberries suffer greatly in drought. (3) Sufficient water supply to enable it to be flooded. (4) A fairly level or even surface, so that the flooding will be of approximately uniform depth over the entire area. (5) Not over-liable to frosts. Bogs which contain moss or sphagnum and which have a peaty or mucky soil are usually chosen. If heath-like shrubs grow naturally in the bog, the indications are all the better. The presence of the Cassandra or Leatherleaf is regarded as a good augury. Black ash, red maple, swamp huckleberry, and white cedar swamps are often very satisfactory. Old mill-ponds often give good results.

Before the Cranberries are planted, the bog must be cleaned of trees, bushes, moss and roots. This may be done by "turfing," which is the digging out of the swamp growth, or by "drowning," which is deeply flooding the place for a year. The method of preparing the surface for receiving the plants varies in different regions. Open ditches are run through the place in sufficient number to carry off the surface water. They are usually made 2 to 4 feet deep. If some water stands in them during the summer, better results are expected. These ditches usually feed into one main or central ditch; and this main ditch is preferably the one which, when dammed at its lower end, floods the bog by backing up the water. Growers prefer, if possible, to divert a living brook through the bog, or to straighten and deepen one which may exist there; but in the absence of a brook, a reservoir may be constructed above the bog. Sufficient water supply should be had to cover the entire area from December until April or early May, to a depth of at least one foot. The lower places will have a deeper covering, but 4 or 5 feet in places usually does no harm in the winter. It also may be necessary to flood in spring or fall, to kill insects or to protect from frosts. The objects of flooding are as follows: (1) to protect the plants from heaving in winter; (2) to avoid late spring and early fall frosts; (3) to drown insects; (4) to protect from drought; (5) to guard against fire. Unless serious contingencies arise, the bog is flooded only in winter. A flooded bog looks like a lake (Fig. 568). Good results are obtained now and then in "dry" or upland bogs, which cannot be flooded; but such bogs or meadows rarely give uniform results, and they are less advised than formerly.



568. Cranberry-picking scene on a Cape Cod bog.
In the upper corner is a bog in full flood (in winter). In the lower is the flume or outlet dam.

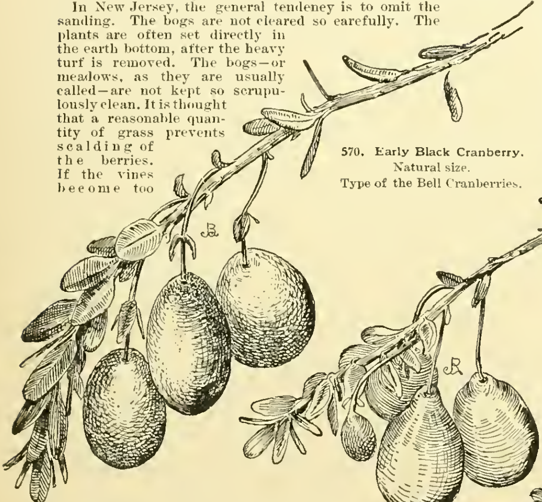


569. Cranberry hand-picker.

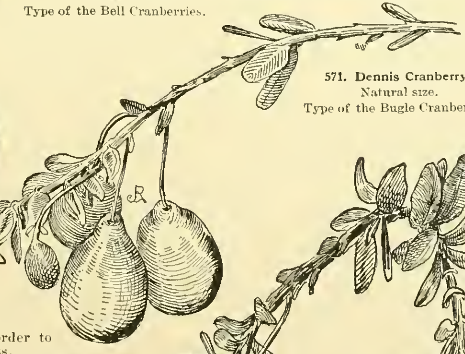
There are three centers of Cranberry growing in North America,—Cape Cod peninsula, New Jersey, Wisconsin. Each has methods peculiar to itself. It was in the Cape Cod region that Cranberry culture began. The first attempts were made early in this century. William Kenrick, writing in 1832 in this "Orchardist," says that "Capt. Henry Hall, of Barnstable, has cultivated the Cranberry twenty years;" "Mr. F. A. Hayden, of Lincoln, Mass., is stated to have gathered from his farm in 1830, 400 bushels of Cranberries, which brought him in Boston market $600." In the second and subsequent editions, Kenricks makes the figure $400. It is not said whether Mr. Hayden's berries were wild or cultivated. At the present day, with all the increase in production, prices are higher than those received by Mr. Hayden. In the third (1841) and subsequent editions, it is said that "an acre of Cranberries in full bearing will produce over 200 bushels; and the fruit generally sells, in the markets of Boston, for $1.50 per bushel, and much higher than in former years." It was as late as 1850, however, that Cranberry culture gained much prominence. It was in 1856 that the first treatise appeared: B. Eastwood's "Complete Manual for the Cultivation of the Cranberry." About 1845, Cranberry culture began to establish itself in New Jersey.

In the Cape Cod region, the bogs are "turfed." The surface covering is cut into small squares and hauled off. The object is to obtain a uniform surface in order that all plants may have equal opportunity. The bog is then "sanded." Rather coarse, clean sand is spread over the entire area to the depth of about 4 inches. In this covering, the vines are planted. The sand keeps down weeds and thereby lessens subsequent labor; it affords a moisture-holding mulch for the muck; it renders the plantation easier to be worked in wet weather, and it prevents the too vigorous growth of the vine. Every four of five years a fresh sanding, to the depth of an inch or less, is given. This keeps the vines short and close. Formerly, whole roots or "sods" of Cranberry were used for planting, but now cuttings are employed. These cuttings are 6- or 8-inch pieces of vigorous runners, with the leaves on. They are thrust obliquely through the sand, only an inch or two of the top remaining uncovered. They are set about 14 inches apart each way. In three or four years a full crop is obtained. The bogs are kept clean by means of hand weeding. At Cape Cod, it is estimated that the sum of $300 to $500 per acre is required to fit and plant a bog. A good yield from a bog in full bearing is 50 barrels to the acre; but 200 barrels have been grown.

In New Jersey, the general tendency is to omit the sanding. The bogs are not cleared so carefully. The plants are often set directly in the earth bottom, after the heavy turf is removed. The bogs—or meadows, as they are usually called—are not kept so scrupulously clean. It is thought that a reasonable quantity of grass prevents scalding of the berries. If the vines become too deep, they are mown or burned in order to secure a fresh growth from the roots.



570. Early Black Cranberry.
Natural size.
Type of the Bell Cranberries.

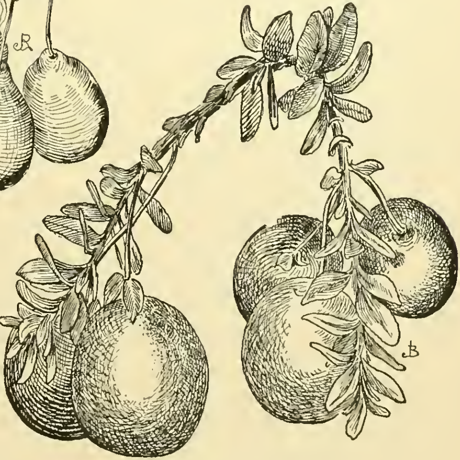


571. Dennis Cranberry.
Natural size.
Type of the Bugle Cranberries

The gathering of the crop is done preferably by hand-picking, particularly in plantations which are well cared for. In some cases the berries are raked off with a steel garden rake, but many of them are lost and bruised, and the vines may be injured. It is said by some that the tearing out of the old and large vines in the raking tends to renew the plants, and this is undoubtedly true; but there are better ways of keeping the vines young and short, as by sanding or mowing. In the East, raking is now rarely employed, unless the crop is very poor or prices very low; or unless hard frost is expected, in which case the berries may be raked, the bog flooded, and the berries caught at the flume. Sometimes the bog is flooded when hard frost is threatened and the water is allowed to remain all winter, and the berries are harvested in the spring; but such early flooding may injure the vines. The price paid for the picking of Cranberries is usually about 40 to 50 cts. a bushel. Three to four bushels is considered to be an average day's picking. There are various devices to facilitate the picking. On Cape Cod a popular implement is the Lumbert picker (Fig. 569). The machine is thrust into the vines, and the operater closes the lid by bearing down with his thumb; drawing it backward pulls off the berries. Usually the pickers are "lined-off" (Fig. 568) by cords stretched across the bog, thus limiting each one to a particular area, which he is required to pick clean. The berries are cleaned by running them through a separator, by passing them over a screen, by floating off the litter by dowsing them in water, and by other means. Dowsing usually reduces the market value. They are then marketed in barrels or crates.

Of varieties there are three general types, determined by the form of the berry,—the bell-shaped (Fig. 570), the bugle-shaped (Fig. 571), and the cherry-shaped (Fig. 572). There are many named varieties in each of these classes, differing in size, color, firmness, keeping qualities, productiveness. These varieties have been selected from plants which have appeared naturally in the bogs. Some of them have been discovered in wild bogs. The demands of the market, as respects varieties, are constantly changing. In Massachusetts, the following varieties are now popular: Early Black, Howe, Matthews, McFarlin.

The Cranberry is now a staple article of food in North America. "Turkey and Cranberry sauce" may be said to be the national dish. The berries are used in great variety of dishes. An effort has been made to open an European market, and an agent was sent abroad in 1893 for that purpose by the American Cranberry Trade Company. The export trade has now assumed some importance, and is growing. The approximate Cranberry crops for a series of years are shown below, in bushels:



572. Makepeace Cranberry.
Natural size. Type of the Cherry Cranberries.

CRANBERRY CROPS, IN BUSHELS

	1877	1878	1879	1880	1881
New England....	....	....	....	250,500	160,825
New Jersey......	....	....	....	128,700	157,014
The West........	....	....	....	113,430	143,186
Totals.........	400,828	295,760	233,000	492,630	461,025
	1882	1883	1884	1885	1886
New England....	193,664	141,964	130,583	280,879	274,799
New Jersey......	78,507	118,524	124,648	198,125	234,254
The West........	50,000	135,507	24,783	264,432	31,396
Totals.........	322,171	395,995	280,014	743,436	540,449

	1887	1888	1889	1890	1891
New England....	307,563	260,000	350,000	375,000	480,000
New Jersey......	163,788	225,000	200,000	200,000	250,000
The West........	140,672	100,000	70,000	225,000	30,000
Totals.........	612,023	585,000	620,000	800,000	760,000

	1892	1893	1894	1895	1896
New England....	375,000	575,000	185,000	420,000	600,000
New Jersey......	160,000	325,000	200,000	200,000	200,000
The West........	65,000	100,000	25,000	10,000	30,000
Totals.........	600,000	1,000,000	410,000	650,000	830,000

	1897	1898	1899
New England....	400,000	425,000	425,000
New Jersey......	250,000	300,000	175,000
The West........	50,000	75,000	85,000
Totals.........	700,000	800,000	685,000

Average prices for Cranberries of good quality now range from $4.50 to $6 per barrel. The following table (by Rider) gives a summary of "opening" and "closing" prices per bushel for 18 Cranberry seasons:

YEAR	OCTOBER	MAY
1877............	$2 00 @ $2 50	$4 00 @ $4 50
1878............	2 00 @ 2 25	2 25 @ 2 50
1879............	1 75 @ 2 00	5 00 @ 6 00
1880............	1 50 @ 2 00	50 @ 1 00
1881............	1 50 @ 2 00	2 00 @ 3 00
1882............	2 75 @ 3 00	2 00 @ 3 50
1883............	2 75 @ 3 00	5 25 @ 5 50
1884............	2 75 @ 3 00	2 50 @ 2 75
1885............	1 50 @ 1 70	50 @ 75
1886............	1 25 @ 1 50	3 75 @ 4 00
1887............	1 75 @ 2 00	2 75 @ 3 00
1888............	1 35 @ 2 00	75 @ 1 00
1889............	1 50 @ 2 00	4 00 @ 5 00
1890............	2 00 @ 2 25	3 00 @ 3 50
1891............	1 50 @ 2 00	1 25 @ 1 00
1892............	1 25 @ 1 50	2 00 @ 3 00
1893............	1 25 @ 1 50	2 00 @ 3 00
1894............	2 00 @ 2 50	50 @ 75

The Low-bush Cranberry, or Wolfberry (*V. Vitis-Idæa*), is much used in Nova Scotia and other parts, and is gathered and shipped in large quantities to Boston; but it is not cultivated. This berry is also common in Europe, where it is much prized. The quantities of this fruit imported into the U. S. from various sources is considerable. For example, between July 24 and Dec. 31, 1897, the following imports were received (as compiled by Rider):

From Nova Scotia..............	31,748 qts. @	$1,284
Sweden and Norway.....	19,905 qts. @	1,014
Newfoundland	7,256 qts. @	279
Germany..................	1,500 qts. @	180
Denmark..................	864 qts. @	27
	61,273 qts. or 1,915 bu.	$2,784

The Cranberry is subject to the attacks of various insects, for most of which the best remedy is flooding, although the fruit-worm is probably best destroyed by spraying with arsenites. There are also fungous troubles. For information on all these difficulties, the bulletins of the New Jersey Experiment Station are the best literature.

The best literature on the Cranberry is comprised in the Proceedings of the American Cranberry Growers' Association, with headquarters at Trenton, N. J. This society holds an "annual meeting" in January, and an "annual convention" in August. Beginning with 1880, it has published regular reports of each of these gatherings. The standard books are White's "Cranberry Culture," largely from the New Jersey standpoint, and Webb's "Cape Cod Cranberries." L. H. B.

NOTES BY A WISCONSIN GROWER.—Cranberries are raised mainly in the states of Massachusetts, New Jersey, Wisconsin, Michigan and Minnesota. The eastern marshes are mostly "made," while in Wisconsin there are thousands of acres of natural marsh as yet entirely uncultivated, as well as much that is cultivated.

The natural soil for the Cranberry is peat. Sand is also good, but, when used alone, must have a new coat of it spread over the ground every few years, as it becomes exhausted and the vines become woody and cease to bear. The ideal soil seems to be a foundation of peat, with from 2 to 4 inches of sand spread over it. It is very desirable that the surface should be level, so that it can all be kept equally moist. The leveling is usually done by "scalping," i. e., taking off the sod and carrying it away. This also removes the moss and other foul vegetation, and gives the vines a chance to take full possession of the ground. If scalping is considered too expensive, the moss may be killed by flooding in winter and drawing the water off in spring; but it takes two or three years for it to rot sufficiently to allow vines to do well. Plowing is sometimes resorted to where it can be done, or the sods turned upside down by some other means.

The best sites for Cranberry raising are those which afford a perfect water supply. There should be a reservoir of water on the upper side of the marsh (and if it is on the north or northwest so much the better, as it will then be more sure protection from frost), which can be emptied on to the marsh at short notice; and there must also be good drainage, to carry it away from the marsh quickly when desired. A level piece of marsh which has vines already growing on it looks very tempting to the uninitiated, but, if it has not a good water supply, it is better to leave it in the natural state and take the crops which grow in favorable seasons, than to spend money improving it.

A good sand marsh may be made near any stream in a sandy region by selecting a spot where water can be drawn from the stream, but there should also be a reservoir to hold water in, as that which comes directly from a running stream is sometimes too cold for Cranberries.

If dams are built from the sods thrown from the ditches, it is desirable, at least for the reservoir dams, to cover them with sand. This should be put mostly on the top and upper side, and should slope from the top of the dam to the center of the ditch. This prevents muskrats from doing very much damage, and the dam is not so apt to be washed out by high water as when built in a perpendicular wall. The cheapest way to move sand to build dams or for spreading on the marsh is to haul it on sleighs in the winter. A platform is built on rockers, so that the load may be dumped at one side of the sleigh; and two loads in a place on a good peat dam will make a heavy reservoir dam. The pit from which sand is taken should be well protected with snow or sawdust to prevent its freezing badly. One of the best ways of making waste-gates is to place three joists lengthwise of the dam a little below the bottom of the ditch, and a platform built upon them, and the whole settled down as firmly as possible; then the dam is built right onto the platform for 3 or 4 feet on each side, and then the sideboards put in place, and cleats nailed up and down into which to slip the sluice boards. It is a good plan to have an outside ditch, which will carry surplus water around the marsh instead of across it, in wet seasons.

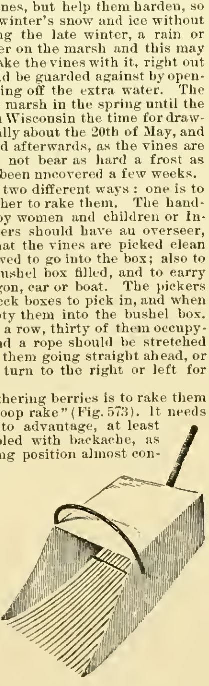
Planting.—There are several methods of planting vines. One way is to sort the vines and then cut them up, roots and all, in pieces about eight inches in length, laying them down three or four in a place, pushing the lower end into the ground by means of a stick shaped like a paddle; or it is sometimes done by a piece of iron fastenened to the bottom of a shoe. This method leaves the plants in an upright position, and they do not grow so rapidly as when pushed into the ground obliquely or laid on top of the ground, as their first growth is to make runners. Sometimes the vines are cut in a hay cutter, sown by hand like wheat, and then rolled. A good method of planting in the west is to take vines without cutting and drop two or three in a place and step on them; if put a foot apart, they will soon cover the ground, and will bear a good crop in three years. The greatest care must be taken, while sorting vines, that they do not dry out, for if they do they are worthless.

In subsequent culture is when water comes into use. The ditches should be about ten rods apart, each ditch having a dam built below it of the material thrown from the ditch; the drain ditches running down through the marsh need not be quite so close together. To promote the growth of vines, it is only desired to hold the ditches about half full, so that the ground may be moist, but if water is kept up onto vines at this time they will be drowned and do nothing. When frosty nights come, after vines have begun to grow, water should be drawn from the reservoir to cover them, and let off the next morning. If the ends of the new shoots get frozen, it is a decided set-back, and especially so when the vines have reached the bearing age, as then it cuts off the crop and hurts the prospect for the coming year by taking the terminal bud. The vines do throw out side shoots, however, and sometimes the second season's crop does not seem to be much affected by it. When the plants are in blossom (which is all through July) the ground must not get too dry, or the blossoms will blast. This trouble was experienced in many places during the summers of '86 and '87, when it was so dry that nothing but a stream fed by springs could begin to furnish a supply of water. Through the most of the summer, it is best to keep the water from 4 to 8 inches below the surface, but before the spring frosts are over it is better to keep it nearly to the surface, and if it is a season of drought, draw water down over the marsh about once a week. After the fruit has set, if obliged to flood as a protection against frost, be sure to draw the water off quickly the next morning, or the berries will be scalded.

The marsh should not be flooded for winter till quite late, some time in November, generally, as the fall frosts do not injure the vines, but help them harden, so that they will endure the winter's snow and ice without injury. Sometimes during the late winter, a rain or thaw will let surplus water on the marsh and this may lift the ice, and that will take the vines with it, right out of the ground. This should be guarded against by opening waste-gates and drawing off the extra water. The flood should be left on the marsh in the spring until the spring frosts are over ; in Wisconsin the time for drawing off the water is generally about the 20th of May, and it must be closely watched afterwards, as the vines are then very tender and will not bear as hard a frost as they will after they have been uncovered a few weeks.

Berries are gathered in two different ways : one is to pick them by hand, the other to rake them. The hand-picking is mostly done by women and children or Indians. Every thirty pickers should have an overseer, whose duty it is to see that the vines are picked clean and that no refuse is allowed to go into the box; also to give a check for every bushel box filled, and to carry the full boxes to the wagon, car or boat. The pickers in the west use shallow peck boxes to pick in, and when these are filled they empty them into the bushel box. The pickers are placed in a row, thirty of them occupying from 80 to 90 feet, and a rope should be stretched each side of them to keep them going straight ahead, or else they are very apt to turn to the right or left for better picking.

The cheapest way of gathering berries is to rake them with what is called a "scoop rake" (Fig. 573). It needs stout men to use these to advantage, at least those who are not troubled with backache, as they must keep a stooping position almost constantly. Rakes should not be used in young vines where there are a great many runners, as they would pull them up by the roots too much, but as the vines get older and the fruit shoots stand up out of the way of the runners, raking does not seem to injure them. The rakers should have ropes stretched between them, each man being given a space from one to three rods wide, and every ten should have an overseer, who will also rake most of the time. Rakers are hired by the day, but hand pickers pick by the box. The rake is much used in the west.



573. The hand scoop rake.

If the berries can be taken to the warehouse in a boat along the ditches, it is the best way, as they bruise easily and should be carefully handled ; but if that is not practicable, then they must be taken in wagons which are driven as close to the picking ground as possible ; or a portable track may be laid onto the marsh and a car used. The bushel boxes which are used have the sides and bottom made of lath, with small spaces between; and these boxes are used to cure the berries in, being piled up in tiers, so that the air can circulate between them. The berry-house should be built with dead air spaces in the walls, and windows should be darkened and building kept closed during the day. See *Storage*.

Cranberries are generally shipped in barrels, but some use bushel crates, though in whatever they are packed, the greatest care should be taken to put them up in good shape. If picked before they begin to ripen, and then packed so that when they reach their destination they are settled from one to three inches in the barrel, dealers will not want them, and this kind of management has much to do with low prices. Before putting into barrels, the berries are put through a Cranberry mill, and then, if there are still a few bad berries, they are put on tables made for the purpose, and the rest of the bad ones picked out by hand.

The profits of the business depend so much upon the amount of expense which has been necessary to improve the marsh that it is impossible to give any exact figures. The smaller the marsh, the quicker it can be improved and made to begin to pay a profit. Anyone who undertakes to improve a large marsh ought not to expect much from it short of ten or fifteen years, though, if carefully managed, it may be made to pay cost of improving after three or four years.

There is a small sand marsh in Wisconsin, made after an attempt to farm the land had utterly failed because the soil was so poor, which has yielded a better income for several years than the best farm in the county. It is a profitable business when honest work and careful management are united in it, but not otherwise.

H. B. TUTTLE.

CRANBERRY TREE. Same as High-bush Cranberry, *Viburnum Opulus*.

CRANESBILL. Loosely applied to the whole genus Geranium. In America it usually means *G. maculatum*.

CRÁSSULA (Latin, *thickish;* referring to the thick leaves and stems). *Crassulàceæ*. This genus gives the name to the order Crassulaceæ, which contains many cultivated succulent plants, and also others of widely different habit,—about 400 species altogether. The order is closely related to the Saxifragaceæ, and differs in having the carpels of the ovary entirely free and equal in number to the petals, but the forms pass easily into the Saxifragaceæ through Francoa and Tetilla, and back again through Triactina. The genera are ill defined, and certain species of Sedum cross over the lines of Crassula, Cotyledon and Sempervivum, while between Crassula and Tillæa no good distinction can be made. For these reasons it seems best to give a key to the genera of garden importance.

A. *Stamens as many as the petals.*

B. *Petals free, or connate only at the base.*

1. CRASSULA. Floral parts in 5's: calyx shorter than the corolla.

BB. *Petals often connate to the middle or beyond.*

2. ROCHEA. Calyx many times shorter than the tube of the corolla.

AA. *Stamens normally twice as many as the petals (sometimes equal in number, especially in Nos. 3, 6, 8).*

B. *Petals free, or connate only at the very base.*

3. SEDUM. Floral parts usually 4–5: scales small.
4. SEMPERVIVUM. Floral parts 6 to many (rarely 5): scales small.
5. MONANTHES. Floral parts 6–12: scales petal-like.

BB. *Petals often connate to the middle or beyond.*

6. KALANCHOE. Calyx 4-parted.
7. BRYOPHYLLUM. Calyx large, inflated, shortly 4-cut.
8. COTYLEDON. Calyx 5-parted.

The floral parts of Crassula are normally 5, rarely 6–9, but cultivation probably changes the number of parts not infrequently. Crassulas are herbs or shrubs, rarely annuals, usually thick and fleshy: lvs. opposite, rarely stalked, often grown together at the base, entire or with a cartilaginous margin: fls. small, white, rose, or rarely yellow, usually in cymes, rarely in heads. For *C. coccinea* and *jasminea*, see *Rochea*. W. M.

Crassulas are greenhouse plants requiring a dry atmosphere during the resting period. While making growth, they may be treated like other greenhouse plants in the way of watering, placing them in the lightest and airiest part of the house. The pots must be drained so that any surplus moisture will easily pass through. The soil should consist of sand, loam, broken brick, and a very small quantity of leaf-soil or thoroughly rotted cow-manure. Propagation is usually from cuttings. Some of the species, such as *C. falcata*, do not give much material for this purpose, and they should, therefore, be headed over and the tops put in dry sand in the spring, allowing water only when they show signs of shrivelling. The cut-over plants should be encouraged to make side shoots, which may be rooted after they are large enough.

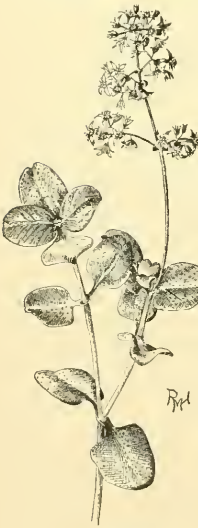
Cult. by G. W. OLIVER.

A. *Floral parts normally in 5's.*

B. *Lvs. petioled.*

cordàta, Soland. Height 1–3 ft.: stem shrubby: lvs. flat, wide, stalked, cordate, obtuse, entire, glabrous, spotted above: cymes panicle-like: fls. reddish, sometimes pure white. Winter.—Closely allied to *C. spathulata*.

spathulàta, Thunb. Glabrous herb: stem somewhat shrubby, decumbent, branching: lvs. stalked, roundish, crenate, glabrous, shining above: corymbs panicle-like: fls. rosy; petals acute. L. B. C. 4:359 as *C. cordata*.—Not advertised for sale, but likely to be cultivated as *C. cordata*.



574. Crassula quadrifida. (× ⅓.)

BB. *Lvs. not petioled.*

C. *Foliage glaucous.*

falcàta, Wendl. Height 3–8 ft.: lvs. grown together at the base, thick, glaucous, oblong, falcate: fls. small, numerous (50 or more), in a crimson, rarely white, dense, terminal corymb: corolla tube ⅓ of an in. long, as long as the limb or shorter. B.M. 2035.

CC. *Foliage not glaucous.*

láctea, Soland. Height 1–2 ft.: stem shrubby, branching, tortuous below: lvs. ovate, narrowed and grown together at the base, glabrous, spotted along the margin: cymes panicle-like, many-fld.: fls. white, small. Winter. B.M. 1771. L.B.C. 8: 735.—A free-flowering window plant of easy culture. There is a form with variegated leaves.

AA. *Floral parts in 4's.*

quadrifida, Baker. Fig. 574. Perennial: lvs. oblong-spatulate, the upper ones rounder, decussate: fls. with their parts in 4's, panicled, white, tinged red. W. M.

CRATÆ̀GUS (ancient Greek name, derived from *kratos*, strength, on account of the hardiness of the wood). *Rosàceæ*, suborder *Pòmeæ*. HAW. HAWTHORN. Shrubs or small trees, usually spiny: lvs. alternate, deciduous, stipulate, serrate, often lobed or pinnatifid: fls. white, in some varieties red, in corymbs, rarely solitary; petal- and calyx-lobes 5; stamens many, rarely less than 10; styles 1–5: fr. a drupe-like pome, with 1–5 1-seeded bony stones. About 70 species, in the temperate regions of the northern hemisphere, most abundant in N. America. Hardy ornamental shrubs and trees, mostly of dense and low growth, with handsome foliage, turning, in most species, to a brilliant coloring in the fall; many have very decorative frs., and also handsome fls. Some of the best, with showy frs., are *C. Crus-galli*, *C. Lavallei*, *C. cordata*, *C. pinnatifida major*, *C. mollis*, but the frs. of the last drop very early, while in most of the others the frs. remain a long time on the branches. Some varieties of *C. monogyna* have very decorative fls.; also *C. mollis*, *C. Crus-galli* and others are handsome in bloom. For the S. states, *C. æstivalis* and the blue-fruited *C. brachyacantha* are among the most decorative. Well adapted for hedges are *C. monogyna*, *C. Oxyacantha*, *C. Crus-galli*, *C. cordata* and many others. The Hawthorns grow in almost any soil and position; best in a rich, loamy, somewhat moist one, and also in strong clay. Prop. by seeds, sown in fall or stratified; before stratifying, most of the pulp may be removed by laying the frs. in shallow piles and allowing them to decay. Then they are mixed with sand or sifted soil and buried in the ground or kept in boxes in a cool cellar. Some species, as *C. cordata*, *C. coccinea*, *C. Crus-galli*, germinate the first year and are sown in spring, while others, especially *C. Oxyacantha* and its allies, do usually not germinate until the second year, and may be kept stratified until the following fall or the second spring. If sown at once, the seed-beds must be heavily mulched during the first summer to prevent drying. The young plants should not be allowed to remain over one year in the seed-beds, as they form long tap-roots and are then difficult to transplant. Varieties and rarer kinds are easily budded or grafted on seedling stock of *C. Oxyacantha*, or other common strong-growing species.

Index: *acerifolia*, 13 and suppl.; apiifolia, 14 and suppl.; *Aronia*, 18; Azarolus, 18; *Carrieri*, 7; coccinea, 3; cordata, 13; Crus-galli, 5; Douglasi, 12, 10; flava, 2; Lavallei, 7; *leucophlæos*, 9; *lucida*, 5; macracantha, 10; mollis, 4; monogyna, 16; nigra, 21; *odoratissima*, 19; orientalis, 19: Oxyacantha, 15, 16; *parvifolia*, 1; pinnatifida, 17: populifolia, 13 and suppl.; prunifolia, 6; punctata, 8; *pyrifolia*, 9; sanguinea, 11; *subvillosa*, 4; tanacetifolia, 20; tomentosa, 9; uniflora, 1.

A. *Foliage of the flowering branches not at all or very slightly lobed; no veins going to the sinuses.*

B. *Fls. 1–3, rarely more.*

1. **uniflòra**, Mœnch (*C. parvifòlia*, Ait.). Dense, low shrub, with numerous slender spines, rarely spineless, 3–8 ft.: lvs. on short not glandular petioles, cuneate, obovate or oblong-obovate, irregularly or doubly crenate-serrate, pubescent on both sides, at length glabrous above, ½–1½ in. long: calyx pubescent, with large serrate lobes: fr. pyriform or globose, yellow, ⅓ in. across, with 2–5 stones. May, June. N. Jersey to Arkansas and Florida. S.S. 4:191.

2. **flàva**, Ait. Shrub or small tree, to 25 ft., usually very spiny: lvs. on short glandular petioles, cuneate, obovate, glandular-dentate, pubescent, at length glabrous and shining above: fr. globular or pyriform, greenish, yellow or red, ⅓ in. across. Va. to Florida. S.S. 4:189. B.R. 23:1932, 1939.

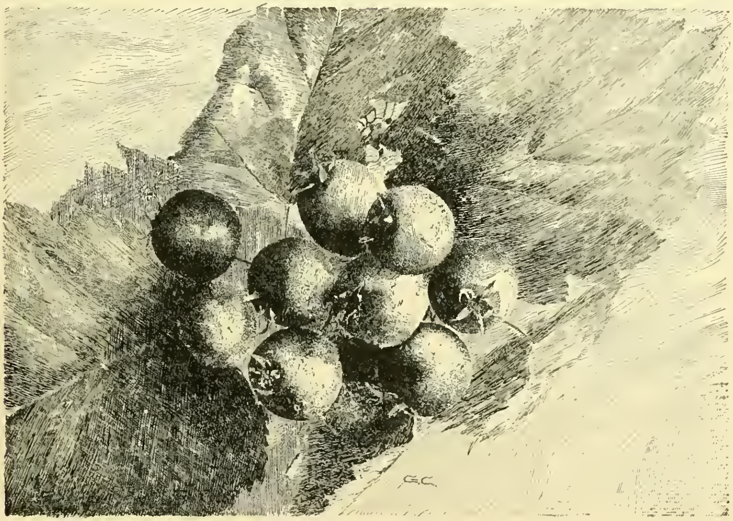
BB. *Fls. in 6–many-fld. corymbs.*

C. *Lvs. on slender, often glandular petioles, usually broadly ovate and truncate at the base, slightly lobed: calyx lobes dentate.*

3. **coccínea**, Linn. SCARLET THORN. Shrub or tree, rarely to 25 ft., with short spines: lvs. broadly ovate, sharply doubly serrate, nearly glabrous beneath, sparingly appressed-pubescent above, 2–3 in. long: corymbs usually slightly villous: fr. red, globose or oval, ⅓–½ in. across. April, May. Newfoundland to Florida and Texas, west to Manitoba. S.S. 4:180. Em. 493. B.M. 3432.—There are a number of allied forms which have been considered usually as mere varieties, but may be perhaps distinct species. None of them, however, surpasses the true *C. coccinea* in decorative value, and they are only of botanical interest.

4. **móllis,** Scheele (*C. subvillòsa,* Schrad. *C. coccínea,* var. *móllis,* Torr. & Gr.). Fig. 575. Tree, to 30 ft., with short, stout thorns: lvs. broadly ovate, sharply and doubly serrate, densely pubescent beneath, 3–4 in. long: corymbs densely villous-pubescent: fls. with red disk: fr. about ½ in. across, usually pear-shaped. April, May. Quebec to Pa., west to Nebraska. S.S. 4:182. Em. 494 (as *C. tomentosa*). G.F. 5:221.—One of the most decorative species, with large, bright green foliage and showy fls. and frs., ripening in September, but dropping soon after maturity.

Var. **tiliifòlia,** Koehne. Lvs. more pubescent, petioles not glandular: stamens 20.



575. **Cratægus mollis** (× ½). One of the best native thorns.

cc. *Lvs. on rather short and stout, not glandular, petioles, cuneate and usually entire at the base, and mostly broadest above the middle.*

d. *Fr. red or yellow, not shining.*

e. *Habit of fr. nodding or pendulous: rather hard.*

f. *Color of lvs. dark green and shining above, chartaceous: calyx lobes erect on the fr.*

5. **Crus-gálli,** Linn. Shrub or tree, to 40 ft.; branches wide-spreading, rigid, often pendulous, with numerous slender spines: lvs. obovate or oblanceolate, irregularly and sharply serrate, quite glabrous, 1–2½ in. long, often semi-persistent: corymbs glabrous: fr. usually globose, red. May–June. Quebec, south to Fla. and Tex. S.S. 4:178. Em. 492. R.B. 1:116. G.F. 7:295.—A very decorative species of distinct habit, handsome in bloom and with showy, bright red fr., remaining on the branches often until spring; the lvs. assume a brilliant orange and scarlet color in fall. Var. **inérmis,** Lge. Spineless form. Var. **lineàris,** Ser. Lvs. linear-lanceolate. Var. **nana,** Nichols. Dwarf form. Var. **ovalifòlia,** Lindl. Lvs. elliptic. B.R. 22:1860. Var. **pyracanthifólia,** Ait. (var. *salicifòlia,* Ait.). Lvs. oblanceolate. Var. **spléndens,** Ait. (var. *lùcida,* Hort.). Lvs. elliptic-oblanceolate, very shining.

6. **prunifòlia,** Pers. Shrub or tree, to 30 ft.: branches spreading or somewhat ascending, spiny: lvs. obovate, or roundish obovate, doubly serrate, pubescent on the veins beneath when young, 2–3 in. long: corymbs pubescent: fr. red; stones with two furrows on the inner side. May–June.—Probably hybrid between *C. Crus-galli* and *C. macracantha.* B.R. 22:1868.

7. **Lavállei,** Herincq. (*C. Carrièri,* Vauv.). Small tree to 20 ft., with spreading branches, nearly unarmed, when older: lvs. elliptic or oblong-obovate, acute, pubescent, glabrous above at length, irregularly serrate, 3–4 in. long: corymbs rather few-fld., pubescent; fls. large, with red disk: fr. bright orange or brick-red, ovoid or globular, ⅔ in. across. May. R.H. 1883:108. G.C. III. 21:118, 119.—Probably hybrid between *C. Crus-galli* and *C. Mexicana;* originated in France.

ff. *Color of lvs. dull above, with impressed veins, pubescent.*

8. **punctàta,** Jacq. Fig. 576. Tree, to 25 ft.: branches horizontally spreading, with short, stout spines or unarmed: lvs. broadly obovate, obtuse or acute, narrowed at the base into a rather long-margined petiole, irregularly serrate: corymbs pubescent: fls. large; calyx lobes entire: fr. pyriform or subglobose, red, dotted, about ½ in. across. May. From Quebec to Ont. and Ga. S.S. 4:184. Var. **aùrea,** Ait. (var. *xanthocárpa,* Roem.). Fr. yellow: lvs. sometimes slightly lobed.

ee. *Habit of fr. erect, becoming soft: corymbs many-fld., large.*

9. **tomentòsa,** Linn. (*C. pyrifòlia,* Ait. *C. leucophlæos,* Mœnch). Shrub or small tree, to 20 ft., with spreading branches unarmed or with short spines: lvs. cuneate, obovate-oblong or elliptic, acute, serrate and often slightly lobed, pubescent, 2–5 in. long: corymbs pubescent; fls. rather small; calyx lobes serrate: fr. usually oval, dull or yellowish red, ¼–⅓ in. across; stones with 2 furrows on the inner side. June. From Hudson Bay to Ga., west to Mich. and Mo. S.S. 4:183. G.F. 2:425. B.R. 22:1877.—Var. **aurantiaca,** Lge. Fr. yellow.

dd. *Fr. shining, blood-red or scarlet, rarely yellow, globose, with soft and juicy flesh; stones with 2 furrows on the inner side (plain in all the foregoing except Nos. 6 and 9).*

10. **macracántha,** Lodd. (*C. coccínea,* var. *macracán-*

tha, Dudl.). Fig. 577. Shrub or small tree, to 20 ft., of dense growth, with numerous long and slender spines: lvs. rather slender-petioled, broadly elliptic or ovate, doubly serrate, glabrous, shining and dark green above, almost glabrous beneath: corymbs more or less villous; fls. fragrant; calyx-teeth glandular-serrate: fr. ⅓ in. in diam. May, June. Quebec to Va., west to Mo. and Dak. S.S. 4:181. B.R. 22:1912. L.B.C. 11:1012 (as *C. glandulosa*). A.G. 11:509.—Sometimes cultivated under the name of *C. Douglasi*. Var. **succulénta**, Rehd. (*C. succulénta*, Schrad.). Lvs. pubescent beneath: pedicels and calyx densely villous.

576. Cratægus punctata.

11. **sanguínea**, Pall. Shrub or small tree, with upright, spreading branches and short spines: lvs. ovate or broadly ovate, narrowed into the petiole, irregularly serrate and slightly lobed, more deeply lobed on vigorous shoots, nearly glabrous, 1½–3 in. long: corymbs pubescent or glabrous; fls. large; stamens 20, with purple anthers: fr. ½ in. in diam. Siber., Dahur., Amurland. Var. **Altàica**, Loud. (var. *xanthocárpa*, Regel). Fr. yellow, smaller: anthers whitish: lvs. more deeply lobed.

DDD. *Fr. black, shining; stones with 2 furrows.*

12. **Doùglasi**, Lindl. (*C. sanguinea*, var. *Doùglasi*, Torr. & Gr.). Tree, to 40 ft., with slender, often pendulous branches, unarmed or with short spines: lvs. short-petioled, broadly ovate or oblong-ovate, serrate and slightly lobed, nearly glabrous, pubescent on the midrib above, chartaceous, 1–4 in. long: corymbs glabrous: calyx lobes triangular-ovate: fr. ripening in Aug. or Sept. May. Brit. Columb. to Calif. S.S. 4:175. B.R. 21:1810.

AA. *Foliage distinctly lobed, with veins going from the midrib to the sinuses (see also No. 1); stones plain on the inner side except No. 15.*

B. *Fr. very small, about ⅙ in. across: calyx lobes separated by a distinct line from the fr. and falling off at length.*

13. **cordàta**, Ait. (*C. acerifòlia*, Mnch. *C. populifòlia*, Walt.). WASHINGTON THORN. Tree, to 30 ft., with slender spines: lvs. slender, petioled, triangular or broadly ovate, usually truncate at the base, 3–5-lobed, sharply serrate, 1½–2½ in. long: corymbs many-fld., glabrous: styles 5: fr. depressed-globose, shining, bright coral-red. June. Ill. to Ala. and Va. S.S. 4:186. B.R. 14:1151.—A very desirable species, with beautiful fall-coloring and large clusters of bright red fr. remaining a long time on the branches.

14. **apiifòlia**, Michx. Shrub or small tree, rarely 20 ft., with stout spines and the branchlets pubescent when young: lvs. slender, petioled, broadly ovate, pinnately 5–7-cleft, serrate, glabrous or pubescent, ¾–1½ in. long: corymbs few-fld., villous, pubescent; styles 1–3: fr. oval, 1-4–1-5 in. high. May. Va. and Fla. to Tex. S.S. 4:188.—A handsome species with graceful foliage and an abundance of white fls. in spring and small but bright-colored frs. in fall.

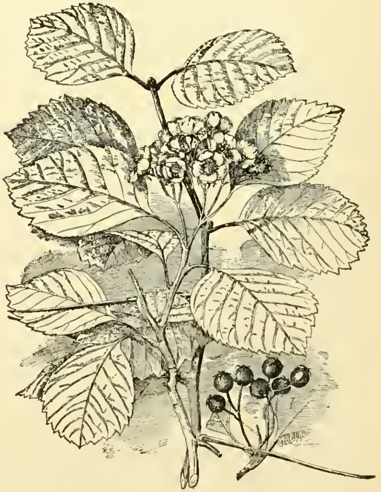
BB. *Fr. ¼ in. or more across: calyx not separated.*

C. *Fr. red or yellow.*

D. *Branches and lvs. glabrous.*

15. **Oxyacántha**, Linn. HAWTHORN or MAY of English literature. Shrub or small tree, to 15 ft., with spreading branches and stout spines: lvs. short-petioled, cuneate or truncate at the base, roundish or broadly ovate, 3–5-lobed, with incisely serrate lobes, 1–2 in. long: corymbs 5–10-fld., glabrous: fr. globular or roundish oval, ⅓–½ in. high, scarlet; stones 2, with 2 furrows on the inner side. May. Eu., N. Afr. B.R. 13:1128 (as *C. oxyacanthoìdes*). Var. **xanthocárpa**, Roem. Has yellow fr., very distinct and showy.—Often confounded with the following, and less commonly cultivated.

16. **monógyna**, Jacq. (*C. Oxyácantha*, Hort.). Shrub or tree, to 20 ft., with stout spines: lvs. on rather slender petioles, ovate, 3–7-lobed, lobes with few teeth at the apex, 1–2 in. long: corymbs many-fld., with usually hairy pedicels: fr. oval, with usually 1 stone, ⅓–½ in. high. May, June. Eu. and N. Africa to Himalayas.—Many garden forms are cultivated; some of the most distinct are the following. With single fls.: Var. **bícolor**, Hort. (var. *Gúmpperi bícolor*). Fls. white, edged pink. F.S. 16:1651. Var. **punicea**, Hort. Fls. deep red. F.S. 15:1509, Fig. 1. L.B.C. 14:1363. Var. **ròsea**, Hort. Fls. pink, petals with white claw. With double fls.: Var. **álba plèna**, Hort. With white double fls. F.S. 15:1509, Fig. 2. Var. **Paùli**, Hort. (var. *coccínea*, Hort. Var. *Paul's New Double Scarlet*). Fig. 578. Bright scarlet, one of the most showy. I.H. 14:536. Var. **punicea plèna**, Hort. Scarlet-red. R.B. 24:161. Var. **rùbra plèna**, Hort. Red. F.S. 15:1509, Fig. 3. Varieties differing in lvs. and habit: Var. **laciniàta**, Loud. Lvs. deeply pinnatifid with incised serrate lobes. Var. **pteridifòlia**, Loud. (var. *filicifòlia*, Hort.). Similar, but lvs. longer, with narrower and more incised lobes. F. S. 20:2076. Var. **quercifòlia**, Loud. Lvs. with broad, rounded and crenate lobes. Var. **hórrida**, Carr. Branches with fascicles of numerous stout spines. F.S. 14:1468. G.C. III. 24:13. Var. **péndula**, Hort. With pendulous branches. Var. **péndula ròsea**, Hort. A pendulous form, with pink fls. Var. **stricta**, Loud. (var. *pyramidàlis*, Hort.). Of fastigiate, upright habit. Var. **semperflòrens**, André (var. *Brùanti*, Carr.). Low, graceful shrub, flowering until fall. R.H. 1883, p. 140. There are also some vars. with variegated lvs.


577. Cratægus macracantha (× ⅓).

17. **pinnatífida**, Bunge. Shrub or small tree, to 20 ft.: lvs. slender-petioled, cuneate, elliptic-ovate, pinnately 5–9-cleft, incisely serrate: corymbs many-fld., usually pubescent: fr. globular or pyriform, dark red, punctate,

½–¾ in. high; stones 3–5. June. Amurland, N. China, Japan. Gt. 1862:366.—Var. **májor,** N. E. Brown. Lvs. larger, less deeply lobed: fr. oval, 1 in. long. G.C. II. 26:620.

DD. *Branchlets and lvs. pubescent, rarely lvs. glabrous: fr. large, often pubescent.*

18. **Azárolus,** Linn. (*C. Arònia,* Sér.). Shrub or tree, to 25 ft.: lvs. short-petioled, cuneate-obovate, deeply 3–5-lobed, with the lobes nearly entire or incised at the apex, grayish green, pubescent, 1½–2½ in. long: corymbs few-fld., densely tomentose: fr. orange-red or yellow, globular or .ovoid, ¾–1 in. across. May. N. Africa, W. Asia. B.R. 22:1897 (as *C. Aronia*). R.H. 1856:441.—Var. **Sinàica,** Boiss. Lvs. glabrous: fr. smaller, reddish yellow. B.R. 22:1855 (as *C. Maroccana*).

578. Paul's Thorn — Cratægus monogyna, var. Pauli.

19. **orientàlis,** Pall. (*C. odoratíssima,* Lindl.). Shrub or small tree, with spreading, almost unarmed branches: lvs. short-petioled, cuneate, obovate or oblong, pinnately 3–5-cleft, with the lobes incisely serrate at the apex, tomentose pubescent, 1–2 in. long: corymb dense, tomentose: calyx lobes entire: fr. depressed globose, brick- or orange-red, ¾–1 in. across. June. S. E. Eu., W. Asia. B.M. 2314. B.R. 22:1885 (as *C. odoratissima*).—Var. **sanguinea,** Schrad. Fr. dark red. B.R. 22:1852.

20. **tanacetifòlia,** Pers. Shrub or small tree: lvs. cuneate, obovate, pinnately 5–7-cleft, with the lobes glandular-serrate, villous-pubescent, 1–2 in. long: corymb dense, 5–7-fld.: calyx lobes large, deeply glandular serrate: fls. large: fr. pubescent, yellow, 1 in. or more across, with laciniate bracts at the base. May, June. W. Asia. B.R. 22:1884. Gt. 43, p. 215.

CC. *Fr. black, shining, globular.*

21. **nigra,** Kit. Shrub or small tree; branches pubescent, with short spines: lvs. short-petioled, ovate or ovate-elliptic, deeply pinnately 5–9-lobed with serrate lobes, slightly pubescent above, densely pubescent beneath: corymbs dense, 10–15-fld., tomentose; pedicels short: fls. white, becoming slightly red: fr. ½in. across. S. E. Eu. L.B.C. 11:1021.

C. acerifòlia, Mnch.=C. cordata.—*C. acerifòlia,* Hort.=C. mollis.—*C. æstivàlis,* Torr. & Gray. Tree, to 30 ft.: lvs. cuneate-oblong, crenate-serrate, pubescent below: corymbs few-fld., glabrous: fr. large, red. S. states. S.S. 4:192.—*C. apiifòlia,* Hort. =C. orientalis.—*C. arboréscens,* Ell.=C. viridis.—*C. berberifòlia,* Torr. & Gray. Allied to C. Crus-galli. Lvs. obovate, rounded at the apex, pubescent as are the corymbs. S. states. S.S. 4:179.—*C. brachyacántha,* Sarg. & Engelm. Tree, to 50 ft.: lvs. elliptic or oblong-lanceolate, rarely 3-lobed, glabrous at length: corymbs many-fld.: fr. large, bright blue. Louisiana, Texas. S.S. 4:177.—*C. Califórnica,* Hort.=C. pinnatifida major.—*C. Carpáthica,* Lodd.=C. nigra.—*C. Celsiàna,* Bosc. Shrub: lvs. pinnately lobed, slightly pubescent beneath: corymbs many-fld.: fr. ovoid, red. Origin unknown.—*C. chlorosárca,* Maxim. Allied to C. sanguinea. Lvs. pinnately lobed, glabrous at length: corymbs many-fld.: fr. black, with green flesh. Manchuria.—*C. coccínea,* var. *víridis,* Torr. & Gray.=C. pruinosa.—*C. crenulàta,* Roxb. =Pyracantha crenulata.—*C. cuneàta,* Miq. Low shrub: lvs. cuneate, obovate-oblong, serrate or slightly lobed: corymbs few-fld.: fr. large, red. Japan.—*C. Dahùrica,* Hort.=C. pinnatifida.—*C. Doùglasi,* Hort., not Lindl.=C. macracantha.—*C. Florentìna,* Zucc.=Pyrus (Malus) cratægifolia.—*C. flòrida,* Loud.= C. uniflora.—*C. Fontanesiàna,* Spach. Allied to C. Crus-galli. Lvs. elliptic or elliptic-lanceolate, almost glabrous, shining above: corymbs many-fld., pubescent: fr. red. Probably hybrid and belonging to C. prunifolia.—*C. glàbra,* Hort., not Thbg.= C. cordata.—*C. glandulòsa,* Much. (C. flava, var. pubescens, Gray). Allied to C. flava. Lvs. broader, of firmer texture, more pubescent and glandular: fr. subglobose, red or yellow. S. states. S.S. 4:190 (as C. flava elliptica). B.R. 22:1890 (as C. spathulata).—*C. grandiflòra,* Koch. Small trees: lvs. elliptic, serrate, often slightly lobed toward the apex, pubescent: fls. 1–3, large: fr. brown, globose, large. Supposed to be a hybrid between Mespilus Germanica and a Cratægus. G.F. 10:35. R.H. 1869, p. 80 (as C. lobata).—*C. heterophýlla,* Fluegge. Allied to C. monogyna. Lvs. larger, usually trifid: fr. larger, bright red: corymbs many-fld. B.R. 14;1161 and 22:1847.—*C. Korolkòwi,* Hort.=C. pinnatifida, var. major; also C. chlorosarca and C. sanguinea, var. Altaica are cultivated sometimes under this name.—*C. lobàta,* Bosc.=C. grandiflora.—*C. lùcida,* Mill.=C. Crus-galli, var. splendens.—*C. Maüra,* Linn. f.=C. Azarolus.—*C. melanocarpa,* Bieb.=C. pentagyna.—*C. Mexicàna,* Sess. & Moç. Small tree, to 20 ft.: lvs. cuneate-oblong, coarsely serrate or slightly lobed, pubescent: corymbs 3–10-fld., tomentose: fr. large, red or yellow. Mexico. B.R. 22:1910. S.B.F.G. II, 3:300.—*C. microcárpa,* Lindl. =C. spathulata.—*C. odoratissima,* Lindl.=C. orientalis.—*C. Oliveriàna,* Dum.-Cours.=C. pentagyna.—*C. pentagyna,* Kit. Shrub or small tree: lvs. pinnately 5–7-cleft, pubescent: corymbs many-fld.: fr. pyriform, black, dull, small. B.R. 22:1874; 23:1933.—*C. populifòlia,* Ell. Allied to C. coccinea. Lvs. smaller, glabrous: fr. green-purple or dull purple, glaucous. N. Eng. to Fla.—*C. pruinòsa,* Wendl.=C. populifolia.—*C. purpùrea,* Bosc.= C. sanguinea.—*C. Pyracántha,* Pers.=Pyracantha coccinea.—*C. pyrifòlia,* Ait.=C. tomentosa.—*C. rivulàris,* Nutt. Allied to C. Douglasi. Shrub: lvs. ovate-lanceolate, serrate, glabrous at length. Oregon to N. Mexico and Calif. S.S. 4:176.—*C. spathulàta,* Mchx. Shrub or tree, to 20 ft.: lvs. cuneate, oblanceolate, crenately serrate or 3-lobed at the apex: corymbs many-fld.: fr. scarlet, globular, ¼ in. across. S. states. S.S. 4:185. B.R. 22:1846 (as C. microcarpa).—*C. succulénta,* Schrad.=C. macracantha.—*C. Tatárica,* Hort.=C. pinnatifida, var. major.—*C. tomentòsa,* var. *móllis,* Hort.=C. mollis.—*C. Tournefòrti,* Griseb. =C. orientalis, var. sanguinea.—*C. Virgínica,* Lodd.=C. glandulosa.—*C. víridis,* Linn. Tree, to 35 ft.: lvs. cuneate, oblong-obovate, irregularly serrate, often slightly lobed, glabrous: corymbs many-fld., glabrous or sparingly villous: fr. scarlet or orange. S. Caro. and Fla. to Texas. S.S. 4:187.

ALFRED REHDER.

CRATÆ̀VA (after Cratevas, an obscure writer on medical plants, not, as sometimes stated, at the time of Hippocrates, but at the beginning of the first century B. C., since he named a plant after Mithridates). *Capparidàceæ.* A genus of 14 species of tropical trees and shrubs: leaflets 3: fls. in corymbs, usually polygamous, with the odor of garlic: sepals and petals 4: stamens 8–23: torus elongated: berries ovate-globose, with a slender stripe. The bark of the Garlic Pear, *C. gynandra,* blisters like Cantharides. *C. religiosa,* from Malabar and the Society Islands, is a sacred tree, and is planted in native graveyards. The bitter, aromatic leaves and bark are used by them in stomach troubles. The above and some other species are cultivated in Europe as ornamental greenhouse shrubs.

religiòsa, Forst. f. (*C. Nurvála,* Buch.-Ham.). Leaflets 2½ to 3 times as long as broad: stamens 20–28.—Cult. by Franceschi, Santa Barbara, Calif.

CREAM NUT. See *Bertholletia.*

CREEPING CHARLIE. A children's name for the fragrant little blue-flowered weed, *Malva rotundifolia,* which bears the "cheeses" dear to boyhood's memory. The name is hardly dignified enough for most botanies. This name is sometimes applied to *Lysimachia nummularia.*

CRÈPIS (the application of this name is obscure). *Compósitæ.* This variable genus contains a few hardy annual and perennial herbs, especially *C. Sibirica,* which resembles a sow-thistle in habit, and has corymbs of reddish blue flowers, about the size of a hawkweed, or a small dandelion. It is one of the coarser border plants, and rare. Rather light, sandy soil, and full exposure to the sun are essentials to the welfare of this plant. It is contented in a rather dry position, either in the rockery, or in the border. It is prop. by division. A common plant on the moss of English thatched cottages is *C. virens,* a yellow-fld. plant, resembling a dandelion.

Sibírica, Linn. Perennial, 2–3 ft. high, and at least as wide when in bloom: plant covered with short rough hairs: root, large, fleshy: lvs. rough, wrinkled, coarsely dentate, somewhat cordate, 12 in. long, including a petiole half as long: fls. bright yellow: involucre loose, hairy. July, Eu., Asia, Minor, Himalayas. Gn. 53, p. 493.—The tallest and largest-fld. of the genus. Its white, plumy masses of seeds are also attractive.

C. aùrea, Reichb. Height 1ft., fls. orange. June. Eu. The commonest perennial species of the genus abroad. Repays rich soil.—*C. rùbra*, Linn. Annual height 6–32 in.: fls. red, usually solitary. Italy. Greece. The commonest of the annual species abroad.

CRESCÈNTIA (after Crescenzi, thirteenth century Italian agricultural writer). *Bignoniàceæ.* This genus is chiefly interesting for the Calabash tree, and has no near allies of horticultural importance. It consists of tropical trees, glabrous: lvs. alternate, solitary or clustered in nodes: fls. large, tubular, with a fluted 5-cut limb, yellowish, with red or purple veins: calyx 2-parted or deeply 5-cut. The Calabash tree is a native of tropical America, is especially familiar in the West Indies, and can be grown outdoors in extreme S. Fla., S. Calif. The outer skin of the fruit is removed, and the seeds and pulp from within, and the hard, woody shell is used for water-gourds and for all sorts of domestic vessels, according to size and shape. The growing fruit can be made to assume various forms by skillful tying. It is a tree, 20 ft. high, and readily distinguished from all others by its peculiar habit of growth, as it bears large, horizontal, scarcely divided branches, which bear clusters of leaves at intervals.

Cujète, Linn. Lvs. 4–6 in. long, broadly lanceolate, tapering at the base: fls. solitary, pendulous; calyx 2-parted corolla constricted below the middle, and then swelled above, malodorous when decaying; stamens 4, sometimes 5. B.M. 3430.

CRESS. The ordinary garden Cress (*Lepidium sativum*), sometimes called peppergrass, is still absent in the majority of American gardens, although its leaves have the pleasant pungency of the Water Cress, and might be used more freely as a condiment, to be served with salads, or for garnishing. The quick sprouting habit of the seed is proverbial. If Cress is wanted in its prime continuously, seed must be sown every few days. The young plants, which may be left thickly in drills, need protection from the flea beetle, as this is as fond of Cress pungency as any gourmand. For winter use, garden Cress may be grown in large flower pots, boxes, or on a bench, in any light and reasonably warm place. There are curled and broad-leaved types. Australian or Golden Cress is a broad, yellowish-leaved variety. Water Cress (*Nasturtium officinale*), a hardy perennial and important market crop, can be grown in moist soil in the greenhouse, or in almost any ditch, pool, or shallow water course. Covered with water, it winters well. To introduce it in any suitable place, all that is necessary is to scatter seed or a few freshly-cut branches, and it will soon spread and flourish. "Erfurt Sweet" is a superior strain. Similar to Water Cress in form of leaf and in taste is the Upland Cress (*Barbarea vulgaris*), a hardy biennial which can easily be grown from seed.

T. Greiner.

CRIMSON FLAG. *Schizostylis coccinea.*

CRINKLE ROOT. One of the names of *Dentaria diphylla.*

CRÌNUM (Greek name for a lily). *Amaryllidàceæ.* A rather large and cosmopolitan genus of splendid flowering bulbs, mostly tender, closely allied to Amaryllis, and distinguished by the longer perianth tube. Lvs. mostly persistent, usually broad; fls. few or many in an umbel, often very fragrant and with three types of coloring, pure white, banded red or purplish down the center, or flushed with the same colors; perianth spreading or funnel shaped; tube straight or curved; segments linear, lanceolate or oblong.

The species of Crinum require widely different culture, and their geographical distribution furnishes an important clue as to their rarity and the degree of warmth required. There are only two hardy species, *C. longifolium* and *C. Moorei*, the latter being less hardy than the former, but with finer flowers. These two species differ from all others in blooming all summer instead of during a short period, and in the greater lasting qualities of their flowers. An interesting hybrid between the two, *C. Powellii*, is hardier than *C. Moorei*, and the flower, though better than *C. longifolium*, is not quite as showy as that of *C. Moorei*. The hybrid has three well marked colors, white, rose and purplish. A single bulb of the white variety has given fifty flowering bulbs in four years. W. Watson says that this cross can easily be repeated by amateurs. The outdoor kinds require a deep, well drained soil and plenty of moisture during the growing season. Speaking of *C. Moorei*, W. Watson, London, says: "For placing in conspicuous positions on terraces or lawns, or in corners where flowers are wanted to combine with architecture or statuary for summer effect, they are of the greatest value. The Agapanthus is frequently grown for such purposes, but the Crinum is scarcely known in this character. Of course large specimens are needed, but once obtained they are not easily lost." The bulbs of Crinums are mostly grown in Holland and in Florida. The only native species, *C. Americanum*, the "Swamp Lily of Florida," makes a brilliant and striking spectacle when seen in dismal places far from civilization. It is no wonder that it is cherished in Florida gardens.

Of the greenhouse Crinums some are evergreen, others decidous; some warmhouse, others coolhouse species. Like Pancratiums, they require too much space to be as popular here as in the Old World. Speaking especially of *C. amabile* and *C. Asiaticum*, Robert Cameron says (G. F. 10: 217): "Crinums thrive in a compost of turfy loam, dry cow-manure and a little charcoal. When they are grown in large pots they do not require annual repotting: in fact, our large plants have not been shifted for the past five years. A top-dressing of good, rich soil is all that is necessary, and when they are well established liquid manure is very beneficial." *C. amabile* may be taken as a type of the coolhouse and *C. giganteum* of the warmhouse kind. Of the latter species, W. Watson says (G. F. 4: 221): "It is gigantic only in the size of its flowers. The erect scapes are produced several times a year at varying seasons. The flowers are powerfully and deliciously fragrant, and last about a week. This species requires plenty of moisture all the year round, and it is happiest when planted in a large pot of rich soil, or better still, in a bed under the shade of palms."

W. M.

Among the great family of large-flowering Amaryllids I do not recall any more beautiful in bloom than *Crinum Moorei* and its hybrid ***C. Powellii.*** The culture of the former is of the simplest. It requires potting, and is not fastidious as to soil. It is well to grow it along into a fair-sized tub with its offsets, of which it is prolific, until it makes a good specimen, as it will then be more effective in the garden when in flower. In late fall it should be removed to a coolhouse and kept fairly dry till new leaves appear in midwinter, when it may have more moisture, the supply being increased on removal outdoors in spring. ***C. Powellii*** has a shorter necked bulb and drooping channelled leaves sometimes 4 feet long, while ***C. Moorei*** has spreading leaves 2 feet or more long. ***C. Powellii*** is especially valuable for its hardiness. In a sheltered place at Elizabeth, N. J., it is cut to the ground, but reappears in the spring, being protected only by a small mound of ashes or earth, which serves to throw off moisture.

J. N. Gerard.

Alphabetical list of species described below: C. Abyssinicum, 16; amabile, 3; Americanum, 4; *aquaticum*, 15; Asiaticum, 1; augustum, 6; *australe*, 2; campanulatum, 15; *Capense*, 9; *cappedum*, 1; Colensoi, 10; crassifolium, 13; Eboraci, 1; erubescens, Ait., 7; *erubescens*, HBK., 8; fimbriatulum, 20; giganteum, 21; grandiflorum, 9; Herberti, 19; *Herbertianum*, 19; *hybridum*, 1; Kirkii, 11; *Kunthianum*, Hort., 19; Kunthianum, Roem., 8; lineare, 17; longifolium, 9; *Mackenii*, 10; *Makoyanum*, 10; Moorei, 10; *Natalense*, 10; *ornatum*, 14; pedunculatum, R.Br., 2; *pedunculatum*, Hort., 1; Powellii, 18; pratense, 5; *riparium*, 9; *scabro-Capense*, 19; scabrum, 19; *Schmidtii*, 10; Sinico-scabrum, 1; variabile, 13; Sanderianum, 14; virgineum, 22; Virginicum, 19; Zeylanicum, 12.

A. *Perianth erect, with spreading, linear segments: stamens spreading. Stenaster.*

B. *Color white: tube greenish.*

1. **Asiáticum**, Linn. Bulb 4–5 in. thick; neck 6–9 in. long: lvs. 20–30 to a bulb, 3–4 ft. long, 3–4 in. broad: peduncle 1½–2 ft. long, 1 in. thick: fls. 20–50 in an umbel; spathe valves 2–4 in. long; pedicels ½–1 in. long: perianth white; tube erect, tinged with green, 3–4 in. long; segments 2½–3 in. long; filaments tinged red, 2 in. long: ovule 1 in a cell. Trop. Asia. B.M. 1073.—Baker gives 5 botanical varieties, of which the most important in the American trade is probably var. **Sinicum**, Baker (*C. pedunculàtum*, Hort., not R.Br.). St. John's Lily. Bulb 6 in. thick, 18 in. long: lvs. 5 in. broad, with undulated edges, forming a massive crown 4–5 ft. high: peduncle 2–3 ft. long: fls. 20 or more: perianth white. China. The bulb usually divides into two of equal size, small offsets are rarely produced. Seedlings flower in 5 years. Var. **declinàtum**, Baker, has a sloping instead of erect fl.; perianth segments tinged red at tip. Sillet. B.M. 2231. Var. **pròcerum**, Baker, is larger than the type, with lvs. 5 ft. long, 6 in. wide: perianth tube and limb 5 in. long, the latter tinged red outside. Rangoon. B.M. 2684. Var. **anómalum**, Baker, is freakish looking, its lvs. being expanded into a broad, membranous, striated and plaited wing. There is nothing like it in the genus. Var. **angustifòlium**, Hort., is dwarf, 2 ft. high. China. B.M. 2908. **C. Ebòraci**, Herbert (*C. hýbridum Todòræ*, Hort.). Similar to the variety next mentioned, but half the size. Garden hybrid between a small form of *C. Asiaticum* and *C. longifolium*. **C. Ebòraci**, var. **cappèdum**, Reasoner (*C. cappedum*, Reasoner). Habit much like *C. Asiaticum*, but lvs. tapering to a slender point, semi-erect, 4 ft. high: fls. about 20, segments 4 in. long, ½ in. broad, spreading, white, sometimes changing to pink. Garden hybrid between *C. Asiaticum*, var. *Sinicum* and *C. longifolium*. Increases both by offsets and splitting of the bulb into two. *C. Sinico-scábrum*, Hort., hybrid of *C. Asiaticum* var. crossed with *C. scabrum*, and intermediate in aspect and fl.

2. **pedunculàtum**, R. Brown (*C. austràle*, Herb.). Bulb 4 in. thick; neck 6 in. long: lvs. 25–30 to a bulb: fls. 20–30 in an umbel; spathe valves 3–4 in. long; pedicels 1–1½ in.: perianth greenish white, not tinged with red outside: filaments short, bright red: style shorter than the filaments: ovules 3 in a cell. Austral. B.R. 52.—The bulb grows above ground on a large rootstock.

BB. *Color purplish red outside: tube purplish red.*

3. **amábile**, Don. Bulb large; neck 1 ft. or more long: lvs. 25–30 to a bulb: peduncle 2–3 ft. long: fls. 20–30 in an umbel, very fragrant; spathe valves 4–5 in. long; pedicels ½–1 in. long: perianth with a crimson center band, tinged outside bright purplish red; tube bright red; segments 4–5 in. long: stamens an inch shorter than the segments. Sumatra. B.M. 1605. R.H. 1856:241.—Supposed by Herbert to be a spontaneous hybrid between *C. Asiaticum*, var. *procerum* and *C. Zeylanicum:* fls. sterile, bulb increases by small offsets. A stately ornament of most Florida gardens; often sold under the name of *C. augustum*, which is a similar but smaller natural hybrid presumably between *C. bracteatum* and *C. Zeylanicum*, and has more obtuse lvs. than *C. amabile*.

AA. *Perianth erect, with spreading, lanceolate segments: stamens spreading. Platyaster.*

B. *Lvs. few, 6–10 to a bulb.*

4. **Americànum**, Linn. Fig. 579. Florida Swamp Lily. Bulb stoloniferous, ovoid, 3–4 in. thick; neck short: lvs. 1½–2 in. broad: fls. 3–6, usually 4; pedicels none or very short: perianth creamy white; tube greenish. Native in river swamps, Fla. and westward. B.M. 1034.

5. **praténse**, Herb. Bulb ovoid, 4–5 in. thick; neck short: lvs. 6–8, 1½–2 ft. long, 1½–2 in. wide, channeled, margin entire: fls. 6–12; perianth white. Var. **élegans**, Carey, has a longer necked bulb, decumbent peduncle, and tube an inch shorter than the segments. B.M. 2592. Var. **venùstum**, Carey, has about 30 fls. in an umbel. Ind.

BB. *Lvs. numerous, 20 or more to a bulb.*

C. *Bulb conical, large, with a long neck.*

6. **augústum**, Roxb. (*C. amábile*, var. *augústum*, Gawl). Bulb conical, 6 in. thick; neck long: lvs. 20–30, 3–4 in. broad: peduncle much compressed: fls. 12–20; pedicels sometimes an inch long; color strong purplish red outside, banded within: tube purplish. Mauritius. Seychelles. B. M. 2397. B. R. 8:679.

579. The Swamp Lily of Florida—Crinum Americanum.
A type of the subgenus with wide-spreading perianth and lanceolate segments.

CC. *Bulb ovoid, 3–4 in. thick; with a short neck.*

7. **erubéscens**, Ait. Bulb ovoid, 3–4 in. thick; neck short: lvs. 2–3 in. broad, slightly rough: fls. 4–12; pedicels none or very short; color reddish outside, white within: tube bright red. Trop. Amer. B. M. 1232. L. B. C. 1:31.

8. **Kunthiànum**, Roem. (*C. erubéscens*, HBK., not Aiton). Lvs. wavy: fls. 4–5 in an umbel; tube longer than in No. 6, 7–8 in. long; color pure white. New Granada. Var. **Nicaraguénse**, Baker, is purple outside, the segments longer and lvs. longer and narrower.

AAA. *Perianth funnel-shaped; tube permanently curved; segments oblong ascending: stamens and style contiguous and declined. (Codonocrinum.)*

B. *Bulbs long-necked.*

C. *Filaments red.*

9. **longifòlium**, Thunb. (*C. Capense*, Herb. *Amarýllis longifòlia*, Linn. *C. ripàrium*, Herb.). Lvs. 2–3 ft. long, 2–3 in. wide; margins rough: fls. 6–12, pedicels 1–2 in. long; perianth tinged red on the back, and sometimes on the face, with a white variety. Cape Colony. Natal. B.M. 661. Var. **álbum**, Hort. Gn. 52, p. 123.—The hardiest Crinum, enduring the winter of the middle states, if protected with litter during cold weather. Propagation by offsets or seed, which is produced abundantly. *C. grandiflòrum*, Hort., is a new hybrid with *C. Careyànum*, said to partake of the hardiness of *C. longifolium*.

CC. *Filaments white or pinkish.*

D. *Margin of lvs. entire: peduncle 2–3 ft. long.*

10. **Moòrei**, Hook. f. (*C. Makoyànum*, Carr. *C. Colénsoi*, *C. Mackènii*, and *C. Natalénse*, Hort. *C. Schmídtii*, Regel). Fig. 580. Bulb ovoid, neck 12–18 in. long: lvs. 2–3 ft. long, 3–4 in. wide, margin entire, veins rather distant, distinct: fls. 6–12; pedicels 1½ to 3 in. long; perianth flushed with rose on both sides, with a white variety; segments wide. Natal and Kaffraria. B.M. 6113. G.C. III. 2:499. R.H. 1877, p. 417. R.H. 1887: 300. R.B. 22: 196; 23: 61. Var. **álbum**, Hort. Gt. 1072. Gn. 52, p. 122, and var. **platypétalum**, Hort., are cultivated. *C. Colensoi* has a longer tube, smaller flower, with a paler and narrower limb.

580. A young plant of Crinum Moorei. Quite weaned from its seed and beginning its own life.

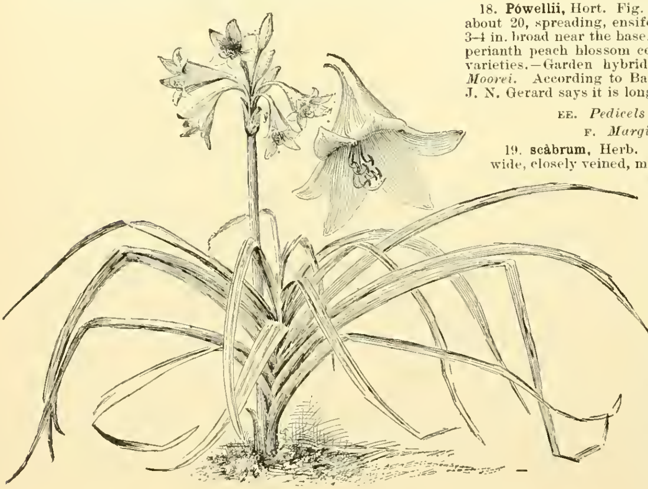
DD. *Margin of lvs. ciliated: peduncle 12–18 in. long.*

11. **Kírkii**, Baker. Bulb globose, 6–8 in. thick, sometimes 6 in. long: lvs. 3½–4 ft. long, 4–4½ in. wide, margin rough, veins close: fls. 12–15; pedicels none or very short; color white, with a very distinct crimson band down the center. Zanzibar. B.M. 6512.—Recognized at a glance by its short, very stout peduncle and very large acuminate lvs., with a distinctly ciliated edge.—A warmhouse species.

BB. *Bulbs short-necked.*

C. *Fls. numerous, usually more than 8 in an umbel.*

12. **Zeylánicum**, Linn. (*Amarýllis ornàta*, B. M. 1171). Bulb globose, 5–6 in. thick: lvs. 10–12, 2–3 ft. long, 3–4 in. wide, wavy, margin roughish; peduncle stout, purple: fls. 10–20; perianth bright red outside in the middle third; segments oblong lanceolate, 3–4 in. long, 1 in. broad. Midsummer. Tropical Asia and Africa.—A warmhouse species. The most commonly cultivated species of the genus. Native throughout tropical Asia and Africa. Usually sold as *C. Kirkii*, which is an allied species from Zanzibar, probably not known outside of one or two botanical gardens.



581. Crinum Powellii.

13. **variábile**, Herb. (*C. crassifòlium*, Herb.). Bulb ovoid, 3–4 in. thick: lvs. 1½–2 ft. long, 2 in. wide, weak: fls. 10–12; perianth flushed red outside: filaments red. Cape Colony.—A rare species.

CC. *Fls. fewer, usually less than 8 in an umbel.*

D. *Bulbs small.*

E. *Tube long, 5–6 in.: stamens nearly as long as the perianth segments.*

14. **Sanderiànum**, Baker (*C. ornàtum*, Bury). Bulb globose, 2 in. thick; neck 2–3 in. long: lvs. 10–12, thin, 1½–2 ft. long, 1½ in. broad, margin much crisped: fls. 3–6; perianth with a distinct band of bright red. Corisco island. Sierra Leone. Gn. 52: 1131.—Closely allied to *C. scabrum*.

EE. *Tube short: stamens much shorter than the segments.*

F. *Lvs. 3–4 ft. long.*

15. **campanulàtum**, Herb. (*C. aquáticum*, Burchell). Lvs. linear, deeply channelled, 3–4 ft.: fls. 6–8: perianth rosy red. Cape colony. Kaffraria. B.M. 2352.—A very distinct species.

FF. *Lvs. 1–2 ft. long.*

G. *Pedicels very short or none.*

16. **Abyssínicum**, Hochst. Bulb ovoid, 3 in. thick: lvs. about 6, 1 ft. long, ½–1 in. wide, veins close, margin rough: fls. 4–6, pedicels very short or none. Mts. of Abyssinia.

GG. *Pedicels ½ in. long.*

17. **lineàre**, Linn. f. Lvs. linear, 1½–2 ft. long, ½ in. broad, glaucous, channelled: fls. 5–6; pedicels ½ in. long; perianth tinged red outside; filaments red. Cape colony.—Rare.

DD. *Bulbs large.*

E. *Pedicels 1–1½ in. long.*

18. **Pówellii**, Hort. Fig. 581. Bulb short-necked: lvs. about 20, spreading, ensiform, acuminate, 3–4 ft. long, 3–4 in. broad near the base, margin smooth: fls. about 8: perianth peach blossom color, with white and purplish varieties.—Garden hybrid of *C. longifolium* and *C. Moorei*. According to Baker, the bulb is globose, but J. N. Gerard says it is long, like a leek.

EE. *Pedicels very short or none.*

F. *Margin of lvs. rough.*

19. **scàbrum**, Herb. Lvs. 2–3 ft. long, 1½–2 in. wide, closely veined, margin scabrous: fls. 4–8: pedicels none or very short: perianth banded bright red. Apr., May. Tropical Africa from Guinea to Abyssinia. B. M. 2180. F.S. 21:2216.—Common in Florida gardens, a very showy and easily cultivated species. **C. Hérberti**, Sweet (*C. scabro-Capénse*, Hort. *C. Kunthiànum*, Hort., not Roem.). Fls. similar to *C. scabrum*, but color lighter, the plant taller and larger. Garden hybrid between *C. scabrum* and *C. longifolium*. This is a doubtful name. *C. Herbertianum*, Wall.=*C. Zeylanicum*. *C. Herbertianum*, Hort. Roem. & Schultes=*C. strictum* **C. Virginicum**, Garden hybrid, resembles *C. Herberti*, but the plant is smaller and the flowers larger and brighter in color. See also No. 22.

20. **fimbriátulum**, Baker. Lvs. as in *C. scabrum*, but margins ciliated with small membranous scales: perianth banded red. Angola. Gn. 55, Feb. 11. Allied to *C. scabrum*.—A wholly different plant is passing in the trade under this name.

FF. *Margin of lvs. smooth.*

21. **gigantèum**, And. Bulb 5–6 in. thick : lvs. 12 or more, 2–3 ft. long, 3–4 in. broad, narrowed toward the base; veins distant, with distinct cross veinlets : fls. 4–6, rarely 8–12 : tube 4–7 in. long ; perianth pure white; segments much imbricated. So. Afr. B.M. 923. F.S. 23:2443. G. F. 4: 223. I. H. 33: 617.—A very fragrant species.

22. **virgineum**, Mart. Foliage as in *C. giganteum :* fls. about 6 ; tube 3–4 in. long ; perianth pure white. South Brazil. See also *C. Virginicum*, under No. 19.

In addition to the above species the following are advertised, but not sufficiently described : *C. nóbile, C. Yemènse*, and *C. Zanzibarènse.*

T. L. Mead and W. M.

CROCÓSMIA (Greek, *odor of saffron*, which is perceivable when the dried fls. are placed in warm water). *Iridàceæ.* This genus has only one species, and is not clearly distinguished by Baker from the closely allied Tritonia, but according to the author of the genus, it differs in the stamens being separated at equal distances instead of grouped at one side, the form of the limb, the tube not swelled at the top, and the fruit 3-seeded instead of many-seeded. The name of this genus is spelled Crocosma by Baker, but it was first spelled Crocosmia.

Crocosmia aurea is a showy bulbous autumn blooming plant, which is hardy south of Washington, D. C., with slight protection, and in the north is treated like Gladiolus, the bulbs being set out in the spring, after danger of frost, and lifted in the fall for winter storage. It is of easy culture, and is propagated by offsets or by seeds. Bulbs should be stored in peat or sphagnum to prevent them from becoming too dry.

aùrea, Planch. (*Tritònia aùrea*, Pappe.). Height 2 ft.: bulb globose, emitting offsets from clefts in the side: scape 1½–2 ft. high, leafy below, naked or only bracted above, compressed, 2-winged : lvs. distichous, shorter than the scape, linear, ensiform, striated, but with a distinct midrib : fls. sessile in the panicle, perhaps 25 scattered over a long season, with buds, flowers and seeds at the same time ; perianth bright orange-yellow toward center; tube slender, curved, 1 in. long; segments longer than the tube, capsule 3-celled. Trop. and S. Afr. July–Oct. F. S. 7: 702. B. M. 4335. Also interesting as one parent of a bigeneric cross resulting in *Tritonia crocosmiflora*. Var. **imperiàlis**, Hort. (Fig. 582), grows about 4 ft. high. Var. **maculàta**, Baker, has dark blotches above the base of the 3 inner segments. J. H. III. 33: 567.

J. N. Gerard and W. M.

CRÒCUS (Greek name of Saffron). *Iridàceæ.* Stemless plants (the grass-like lvs. rising from the ground or corm), with solid bulbs or corms. Fls. showy, in many colors, funnel-shaped and erect, with a very long tube and 6 nearly or quite equal segments. Stamens 3. Ovary 3-loculed: seeds many, nearly globular. The flowers open in sunshine. They come in fall or spring, but the best known species are spring-flowering, which are amongst the earliest of spring bloom. The new corm usually grows on top of the old one each year, so that the plants tend to rise out of the ground. The corms, therefore, should be lifted and replanted every three or four years. Crocuses force easily (see *Bulb*). A half dozen corms may be planted in a 4-inch pot for this purpose. The genus Crocus is S. European and Southwestern Asian. It has about 70 recognized species. The best account of the Crocuses is G. Maw's superb Monograph of the Genus Crocus, 1886. A popular account of the history and species, by Baker, will be found in Gardeners' Chronicle for 1873, pp. 107, 179, 291, 434, 542, 609, 680, 1402, 1431, 1466, 1533, 1633. A condensed account is contained in Baker's Handbook of the Irideæ, 1892.

L. H. B.

Many forms of Crocus are well known in gardens, where they are justly valued as among the showiest and brightest of winter and spring flowers. About two-thirds of the species are classed as vernal and the balance as autumnal flowering; but the various members of the tribe would furnish nearly continuous bloom from August to May were the season open. While there are numerous species interesting to a botanist or a collector, practically the best for general cultivation are *C. Imperati, C. Susianus* (Cloth of Gold Crocus) and the Dutch hybrids, mostly of *C. Mœsiacus.* These flower in about the order named. The rosy flowers of *C. Imperati* may be expected with the earliest snowdrops. The named species, having shorter flower tubes than the Dutch hybrids, are not as liable to injury by the severe weather of the early year. The autumnal species are not satisfactory garden plants, the flowers mostly appearing before the leaves, and being easily injured. *C. speciosus* and *C. sativus* are probably the most satisfactory. The latter species has been cultivated from time immemorial, the stamens having a medicinal reputation, and being a source of color (saffron). The cultivation of this species is a small industry in France, Spain and Italy.

The corms should be planted about 3 inches deep, in a well-worked and perfectly drained soil which is free from clay or the decaying humus of manure, etc. They should be carefully examined and all bruised and imperfect ones rejected, as they are very susceptible to attacks of fungi, which, gaining a footing on decrepit corms, will spread to others. The careful gardener will examine all exotic small bulbs annually, or at least biennally, until they show by the perfection of their new bulbs that they have become naturalized, or are suited to their new environment. In this case they may be allowed to remain until crowding requires their division. This examination should take place after the leaves are matured and dried up. Increase may be had from new corms which are produced more or less freely in different species over or on the sides of old corms. Seeds are often produced freely, but are apt to be overlooked, as they are formed at the surface of the soil. These germinate readily and most freely at the growing time of the plant. They should preferably be germinated in seed pans, which should be exposed to freezing before the natural germi-

582. Crocosmia aurea, var. imperalis (× ½).

nating time. They usually form flowers the third season. The Crocus, as is well known, is amenable to modern, forcing. It is also useful for naturalizing in the lawn, although the grass will run out the plants in a few years, if the bulbs are not replaced by strong ones.

J. N. Gerard.

Crocuses are scarcely known in the Amer. trade under their species names. They have been much hybridized and varied. The common Crocuses of the trade have descended from *C. vernus* chiefly, but *C. Susianus*, *C. Mœsiacus*, *C. stellaris*, *C. biflorus* and *C. sativus* are frequent. The Dutch bulb-growers cultivate many species, and these are offered for sale in their American lists; the species are therefore included in the following synopsis.

Index: Ancyrensis, 4; asturicus, 26; *aureus*, 2; Banaticus, 8; biflorus, 6; Boryi, 24; Byzantinus, 29; chrysanthus, 5, 15; etruscus, 13; Hadriaticus, 18; Imperati, 14; *iridiflous*, 29; *lacteus*, 2; longiflorus, 20; medius, 25; Mœsiacus, 2; nudiflorus, 23; Olivieri, 15; *Orphanidis*, 24; pulchellus, 28; reticulatus, 12; Salzmanni, 22; sativus, 17; serotinus, 21; Sieberi, 11; speciosus, 27; stellaris, 3; Susianus, 1; Suterianus, 15; *Syriacus*, 9; Tommasinianus, 10; Tourneforti, 24; vernus, 9; versicolor, 7; vitellinus, 16; zonatus, 19.

A. *Blooming in spring.*

B. *Style-branches entire or merely toothed.*

C. *Fls. yellow, at least inside.*

1 **Susiànus**, Ker. Cloth of Gold Crocus. Corm ¾ in. in diam.: lvs. 6–8 in a tuft, reaching to the fl., narrow-linear, with revolute edges and a central band of white: perianth segments 1½ in. or less long, orange-yellow, becoming reflexed, the outer ones brownish or striped on the outside; anthers orange, longer than the filaments; style-branches long and spreading. Crimea. B.M. 652.—Blooms very early.

2. **Mœsiacus**, Ker (*C. aùreus*, Sibth. & Sm.). Dutch Crocus. Later, corm larger: lvs. 6–8 in a tuft, overtopping the fl., narrow-linear, with reflexed edges and white central band: segments very obtuse, bright yellow, 1½ in. long, ½ to ⅓ the length of the tube: anthers pale yellow, hastate at the base, somewhat longer than the filaments; style-branches overtopped by the anthers. Transylvania to Asia Minor. B.M. 2986.—Variable. A sulfur-yellow form is *C. sulphùreus*, Ker, B.M. 1384. There is a striped form. B M. 938. A cream-white form is *C. lácteus*, Smith.

3. **stellàris**, Haw. Supposed to be a hybrid of the above, and known only in cult. Blooms with No. 2. Lvs. only 4–6, narrow-linear, reflexed edges, white-banded: perianth-tube short, the segments 1–1½ in. long, bright orange, the outer ones striped and feathered with brown on the back; anthers pale orange, a little longer than the filaments; style-branches somewhat overtopping the anthers.

4. **Ancyrénsis**, Maw. Corm ¾ in. in diam.: lvs. 3–4, as tall as the fl., very narrow: perianth-tube exserted; segments bright orange-yellow, 1 in. or less long, not striped, nor colored outside; anthers orange-yellow, much longer than the filaments; style-branches red-orange. Asia Minor.—Blooms early.

5. **chrysánthus**, Herb. (not B.R. 33:4. Fig. 1, which= *C. Olivieri*, var. *Suterianus*). Corm small: lvs. as high as the fl., very narrow: perianth-tube 2–3 times as long as the segments, the latter 1¼ in. or less long, and plain orange-yellow (varying tinted or striped on the outside, or even nearly white); throat glabrous; anthers orange, twice as long as the roughened filaments; style-branches red-orange. Macedonia and Asia Minor.

CC. *Fls. lilac or white.*

6. **biflòrus**, Mill. Scotch Crocus. Corm ¾ in. or less in diam.: lvs. 4–6, overtopping the fls., very narrow, with deflexed edges and a white central band: perianth-tube exserted, the segments 1½ in. long, purple tinged, the outer ones 3-striped down the back, the throat bearded and yellowish; anthers orange, exceeding the filaments; style-branches orange-red. S. and southwestern Eu. B.M. 845.—Runs into many forms, some of them almost white

7. **versícolor**, Ker. Corm ¾ in. or less in diam.; lvs. 4–5, as high as the fls., otherwise like the last; perianth-tube exserted: segments 1½ in. long, pale or dark purple, often striped and feathered with dark purple; throats glabrous, whitish or yellowish; anthers yellow, twice as long as the filament; style-branches, orange-yellow, equalling or overtopping the anthers. S. France. B.M. 1110.

8. **Banáticus**, Heuff. Corm globular, ½ in. in diam.: lvs. usually 2, thin and flattish, and becoming ¼ in. broad, glaucous beneath: perianth-tube scarcely exserted; segments 1½ in. or less long, bright purple, and never striped, but often dark-blotched towards the tip; throat glabrous; anthers orange, a little longer than the white filaments; style-branches short, orange-yellow, somewhat fringed at the tip. Hungary.

9. **vérnus**, All. Fig. 583. Corm 1 in. or less in diam.: lvs. 2–4, as high as the fl., often ¼ in. broad, glaucous beneath, but green above, with reflexed edges, and a central white band; perianth segments 1–1½ in. long, lilac, white or purple-striped; throat pubescent, never yellow; anthers lemon-yellow, exceeding the filaments; style-branches orange-yellow. S. Eu. B.M. 860, 2240. R.H. 1869, p. 331. Gn. 54, p. 79. The commonest garden Crocus.

583. Crocus vernus (× ½).

10. **Tommasiniànus**, Herb. Corm globular, ½ in. in diam.: lvs. appearing with the fls., narrow (⅛ in. broad): perianth-tube little exserted; segments 1½ in. or less long, pale red-bluish, sometimes dark blotched at the tip; throat glabrous; anthers pale orange, a little longer than the white glandular filaments; style-branches short, orange-yellow. Dalmatia and Servia.—Distinguished from *C. vernus* by its glabrous throat.

11. **Sièberi**, Gay. Corm globular, ¾ in. diam.; lvs. 4–6, as high as the fl., glaucous beneath, ⅙ in. broad: perianth-tube short-exserted; segments 1–1½ in. long, color of *C. vernus*; throat yellow and glabrous; anthers orange, twice as long as filaments; style-branches nearly entire, orange-red. Greece, Crete.

12. **reticulàtus**, Bieb. Corm ¾ in. in diam., covered with honey-combed fibers: lvs. 3–5, as high as the fl., very narrow, with reflexed edge and a white band: perianth-tube much exserted; segments 1–1½ in. long, white to purple, the three outer ones striped; throat glabrous; anthers orange, twice the length of the orange filaments; style-branches scarlet, overtopping the anthers. S. E. Eu.—Varies to white.

13. **Etrúscus**, Parl. Corm 1 in. or less in diam.: lvs. about 3, very narrow, as tall as the fl.: perianth-tube short exserted: segments 1–½ in. long, lilac, or the outer

ones cream colored and sometimes purple-feathered outside; throat yellow, slightly pubescent; anthers orange, twice as long as the glabrous filaments; style-branches nearly entire, orange. Italy.

BB. *Style-branches fimbriate, branched, or cut into very narrow divisions.*

14. **Imperàti**, Ten. Corm nearly or quite 1 in. in diam.: lvs. 4–6, exceeding the fls., very narrow; perianth-tube little exserted; segments 1–1½ in. long, lilac or even white, the outer ones buff and 3-striped on the outside; anthers yellow, exceeding the filaments; style-branches fimbriate. Italy. B.R. 23:1993. Gn. 54, p. 79.

15. **Olivièri**, Gay. Corm nearly globose, ½–¾ in. in diam.: lvs. 4–5, as tall as the fl., becoming ¼ in. broad: perianth tube little exserted; segments bright orange yellow and never striped, 1½ in. or less long; throat glabrous; anthers orange, twice the length of the roughish filaments; style-branches orange, slender-forked. Var. **Suteriànus**, Baker (*C. chrysánthus*, Bot. Reg.) has narrower and more rolled lvs. Greece to Asia Minor.

16. **vitellìnus**, Wahl. (*C. Syrìacus*, Boiss & Gaill.). Corm ¾ in. or less in diam.: lvs. 4–6, as high as the fls., narrow-linear; perianth tube short, exserted; segments 1 in. or less long, orange-yellow, the outer brown-tinged outside; style-branches divided into many capillary parts. Asia Minor. B.M. 6416.—Rare in culture.

AA. *Blooming in fall.*

B. *Style-branches entire.*

17. **satìvus**, Linn. Saffron Crocus. Corm 1 in. or more in diam.: lvs. 6–10, as tall as the fl., very narrow, ciliate-edged; perianth-tube little exserted; segments oblong and obtuse, bright lilac or even white; throat pubescent; anthers yellow, longer than filaments; style-branches 1 in. or more long, bright red (the source of saffron). Asia Minor. R.H. 1895, p. 573.—The commonest fall-blooming species.

18. **Hadriáticus**, Herb. Much like *C. sativus:* usually smaller-fld.. pure white, the segments pubescent at base; anthers bright orange, more than twice longer than the white or purple filaments. Greece, etc.—Runs into several forms.

19. **zonàtus**, Gay. Corm somewhat flattened or deflexed, ½–¾in. in diam.: lvs. appearing after the fls., narrow-linear: perianth-tube exserted, 2–3 in.; segments 1–2 in. long, rose-lilac, purple-veined and orange-spotted within; throat yellow, pubescent; anthers white, 2–3 times longer than the yellow filaments: style-branches short and yellow. Cilicia. G.C. III. 23:85.

BB. *Style-branches fimbriated or forked at the top.*

20. **longiflòrus**, Rafin. Corm ½in. diam.: lvs. 3–4, very short at flowering time, very narrow: perianth-tube much exserted; segments oblong and bright lilac, 1½ in., never striped; throat slightly pubescent, yellow; anthers orange, more than twice as long as the filaments: style-branches scarlet, slightly compound. S. Eu.—Not frequent.

21. **seròtinus**, Salisb. Corm 1 in. or less: lvs. 4–6, as high as the fl., very narrow: perianth-tube little exserted; segments oblong, 1½ in., lilac or purple, indistinctly or not at all striped; throat glabrous; anthers yellow, much exceeding the filaments: style-branches orange-yellow, fimbriated. Spain.—Not frequent.

22. **Sálzmanni**, Gay (*C. tingitànus*, Herb.). Corm somewhat depressed, 1 in. in diam.: lvs. about 6, not prominent at flowering time, very narrow: perianth-tube much exserted; segments 1½ in. long, plain lilac; throat pubescent, yellowish; anthers orange, longer than the filaments: style-branches slender, orange. Morocco.

BBB. *Style-branches capillary-divided.*

23. **nudiflòrus**, Smith. Corm very small, stoloniferous: lvs. 3–4, appearing after the fls., very narrow: perianth-tube much exserted; segments 1½–2 in., lilac; throat glabrous; anthers large and yellow, twice as long as the filaments. Mts. S. France and Spain.—Long known in cult., but not common.

24. **Bòryi**, Gay. Corm globular, ¾ in. or less in diam.: lvs. 3–6, narrow-linear, as high as the fls.: perianth-tube short-exserted; segments 1–1½in. long, white, sometimes lilac-lined at the base outside; throat yellow, glabrous; anthers white, somewhat longer than the orange filaments: style-branches scarlet, divided into many capillary segments. Var. **Tournefòrtii**, Baker (*C. Orphanìdis*, Hook. f. B.M. 5776) has lilac fls. Greece.

25. **mèdius**, Balbis. Corm globular, 1in. or less in diam.: lvs. 2–3, appearing in spring, narrow, becoming a ft. or more high: perianth-tube much exserted; segments 1½–2 in. long, bright lilac; throat glabrous, whitish; anthers pale orange, twice the length of the yellow filaments: style-branches scarlet, with many capillary divisions. S. France, Italy.

26. **Astùricus**, Herb. Corm globular, ¾ in. or less in diam.: lvs. about 3, appearing in fall but not maturing till spring: perianth-tube short-protruded; segments 1½ in. long, lilac; throat pubescent; anthers bright yellow, longer than the white filaments: style-branches orange, with many capillary divisions. Spain.

27. **speciòsus**, Bieb. Corm not stoloniferous, 1 in. or less: lvs. usually 3, developing after the fls., thin, very narrow, becoming 1 ft. long: perianth-tube much exserted; segments 1½–2 in., lilac and feathered with darker color; anthers very large, bright orange, much exceeding the filaments. S. E. Eu. and Asia. B.M. 3861. B.R. 25:40.—Handsome.

28. **pulchéllus**, Herb. Corm small, somewhat depressed: lvs. produced after flowering, maturing in spring: perianth-tube much exserted; segments 1–1½ in. long, bright lilac, more or less indistinctly striped; throat glabrous, bright yellow; anthers white, longer than the pubescent yellow filaments: style-branches orange, with many capillary branches. Greece to Asia Minor. B.R. 30:3.

29. **Byzantìnus**, Ker (*C. iridiflòrus*, Heuff.). Corm ½ in. in diam.: lvs. 2–4, developing after the fls.: perianth-tube much exserted; segments 2 in., or less long, the outer ones dark lilac and acute, the inner ones shorter and pale lilac or white; anthers orange, longer than the filaments. S. E. Eu. B.M. 6141. B.R. 33:4.—An old garden plant, but rarely seen in this country.

L. H. B.

CROSNES. See *Stachys Sieboldi.*

CROSS. The offspring of any two flowers that have been cross-fertilized. A cross-breed is a cross between varieties of the same species. Synonyms are half-breed, mongrel, variety-hybrid. Crossing is the operation of cross-pollinating. Cross-pollination is the transfer of the pollen of one flower to the pistil of another.

CROSSÁNDRA (Greek, *fringed anthers*). *Acanthàceæ.* Greenhouse evergreen shrubs of minor importance, comprising 9 species from India, tropical Africa and Madagascar. The one in the trade has handsome 4-sided spikes or scarlet-orange fls. The perianth has 5 segments, the 2 upper ones being smaller. It is cultivated south outdoors to a slight extent, and also rarely in northern greenhouses.

undulæfòlia, Salisb. (*C. infundibulifórmis*, Nees). Height 1 ft., rarely 3 ft.: lvs. often in 4's, especially below, but also opposite, ovate acuminate, stalked: fls. scarlet-orange, overlapping one another in dense spikes, 2–3 in. long. Ind. B.M. 2186. R.H. 1891:156.

C. flàva, Hook. Unbranched shrub, 6–8 in. high: stem green, glabrous: lvs. opposite, close together, large for the size of the plant, 6 in. long, obovate lanceolate, dark green above, paler beneath, wavy, more obtuse than in the above; lower lvs. stalked, upper ones sessile: spike 4-sided, spiny: fls. yellow; tube much exserted, jointed. Trop. W. Afr. B.M. 4710.—*C. Guineénsis*, Nees. Height 2–6 in.: stem light red, rusty pubescent: lvs. 2–4 pairs, 3–5 in. long, elliptic, green above, with golden netted nerves, reddish beneath: spike solitary, terminal, slender, 3–5 in. high: fls. numerous, small, pale lilac, with 2-darker spots on the 2 smallest segments, and a white eye. Guinea. B.M. 6346.—A handsome foliage plant.

CROSSWORT. Properly *Crucianella.* Loosely, the crucifers.

CROTALÁRIA (Greek, *rattle, castanet;* from the rattling of the seeds in the pod). Rattle-box. A very large, tropical genus, of which the most interesting species is *C. retusa*, a hardy, yellow-fld. annual, which has been compared to a dwarf sweet pea. For best results, the seed should be started early indoors, after being soaked in warm water. The name is commonly misspelled Crotolaria. Greenhouse kinds are subject to red spider. *C. juncea*, yields the Sunn hemp of India.

A. *Lvs. simple.*

retùsa, Linn. Annual, 1½ ft. high: branches few, short: lvs. entire, very various in shape, but typically obovate with a short mucro, clothed beneath with short appressed hairs : -fls. about 12 in a raceme, yellow, streaked or blotched with purple; standard roundish, notched. Cosmop. June–Aug. — Introduced 1896, as a novelty and called "dwarf golden yellow-flowering pea," "golden yellow sweet pea," etc. The flowers are much less fragrant than the true sweet pea.

AA. *Lvs. foliolate.*

longirostràta, Hook. & Arn. Greenhouse plant, herbaceous or somewhat shrubby, much branched, 3 ft. high: branches long, slender, glabrous; petioles 1½ in. long; leaflets 3, oblong, with a minute mucro, glabrous above, hoary beneath, with very short, appressed, silky hairs: racemes erect: calyx with 2 upper lobes ovate, the 3 lower ones lanceolate: fls. as many as 25 in a raceme, yellow with reddish stripe along the back of the unopened flower; standard wider than long, reflexed, notched. W. Mex., Guat. B.M. 7306. F.R. 1:809.

Capénsis, Jacq. Stout, much branched shrub, 4–5 ft. high: branches terete, appressedly silky; stipules when present petiolulate, obovate and leaf-like, obsolete or wanting on many petioles; leaflets broadly obovate, obtuse or mucronulate, glabrous or minutely pubescent on one or both sides: racemes terminal or opposite the lvs., loose, many-fld.: calyx and pod pubescent; wings transversely wrinkled and pitted. S. Afr.—Cult. in Fla. by Reasoner Bros.

W. M.

CRÒTON (Greek name of another plant). *Euphorbiàceæ.* Some 500 species of trees, shrubs, or herbs, widely distributed. They are sometimes diœcious, but commonly the fls. are monœcious and mostly in terminal spikes or racemes. Calyx of sterile fls. 4–6 (usually 5) parted, the stamens 5 or more; petals usually present, but small. Calyx of fertile fls. 5–10 parted, petals none or mere rudiments, the ovary 3-loculed. Lvs. usually alternate. A few species are native to the U. S.; they are mostly annual herbs of no horticultural value. The Crotons of florists are *Codiæums*, which see.

C. Tíglium, Linn., is the only species known to be in the Amer. trade. The seeds yield the Croton oil of commerce, one of the most powerful of purgatives. It is a small tree of Southeastern Asia. Lvs. ovate-acuminate, serrate, stalked, varying in hue from metallic green to bronze and orange. Offered in South Cal. as an ornamental and curious plant.

L. H. B.

CROWFOOT. See *Ranunculus.*

CROWN, or CORONA. Any outgrowth from the throat of the perianth, as the trumpet of a Narcissus, or the fringe of a Passion Flower. Crown is also applied to the top of a bulb, corm, or upright rootstock: also that part of a plant at the surface of the ground.

CROWN BEARD. *Verbesina.*

CROWN IMPERIAL. *Fritillaria Imperialis.*

CROWN OF THORNS. *Euphorbia splendens.*

CROWN-TUBER. A tuber of which the top is stem and the lower part root, as the radish.

CRUCIANÉLLA (Latin, *a little cross ;* from the arrangement of the lvs.). *Rubiàceæ.* CROSS-WORT. This genus contains a hardy rock plant of minor importance. Not more than 21 species, of herbs often woody at the base; branches usually long, slender, 4-cornered: upper lvs. opposite, without stipules: lower lvs. or all in whorls of 3 or more, linear or lanceolate, rarely ovate or obovate: fls. small; white, rosy or blue. Natives of the Mediterranean region and western Asia. The genus is closely related to Asperula, and is distinguished by the flowers having bracts, not an involucre, and the style branches distinctly unequal instead of nearly equal. The species below has lately been referred to Asperula. It is of easy culture, preferring light, moderate loam and partial shade. A delicate plant for the front of borders, and capital for the rockery. Prop. chiefly by division, and also by seeds.

stylòsa, Trin. (*Aspèrula ciliàta*, Rochel). Prostrate, 6–9 in. high: lvs. in whorls of 8 or 9, lanceolate, hispid: fls. small, crimson-pink, in round terminal heads half an inch in diam.; floral parts in 5's; style club-shaped, long exserted, very shortly twice cut at the top. June–Aug. Persia.

J. B. KELLER and W. M.

CRUEL PLANT. Same as Mosquito Plant, *Cynanchum acuminatifolium.*

CRYPTÁNTHUS (Greek, for *hidden flower:* the flowers concealed beneath the bracts). *Bromeliàceæ.* Brazilian epiphytal Bromeliads, differing from Æchmea and Billbergia (which see for culture) in the tubular calyx and the dense heads of fls. nearly sessile amongst the lvs. Mongr. by Mez (who recognizes 8 species) in DC. Monogr. Phaner. 9 (1896).

A. *Lvs. not narrowed or petiolate above the sheath.*

acaùlis, Beer (*Tillándsia acaùlis*, Lindl. *C. unduldtus*, Otto & Dietr.). A few inches high, suckering freely: lvs. sea-green, long-pointed and spreading, weak-spiny: fls. white, nestling deep in the foliage. B.R. 14:1157.—A very variable plant, of which Mez recognixes the following leading types:

Var. **genuina**, Mez. Stemless or very nearly so : lvs. sub-elliptic-lanceolate, strongly undulate, gray-scurfy beneath, scurfy above.

Var. **discolor**, Mez (*C. díscolor*, Otto & Dietr.). Stemless or nearly so: lvs. elongated, scarcely undulate, silvery-scurfy below, glabrous or nearly so above.

Var. **rùber**, Mez (*C. rùber*, Beer). Produces a branching stem or trunk: lvs. short, strongly undulate, reddish.

Var. **bromelioìdes**, Mez (*C. bromelioìdes*, Otto & Dietr.). Stem tall: lvs. much elongated, scarcely undulate, remotely spinulose.

Var. **diversifòlius**, Mez (*C. diversifòlius*, Beer). Stem-bearing: lvs. elongate-lingulate, deep green above, silvery-scurfy beneath.

zonàtus, Beer. Lvs. oblong-lanceolate, the margin undulate and densely serrate-spinulose, marked with transverse bands of white: fls. white.

bivittàtus, Regel (*Billbérgia bivittàta*, Hook. *B. vittàta*, Hort.). Nearly or quite stemless: lvs. long-oblong, curving, long-pointed, somewhat undulate, spiny, dull brown beneath, green above and with two narrow buff or reddish bars extending the length of the leaf: fls. white. B.M. 5270.

AA. *Lvs. narrowed or petiolate above the sheath.*

Beùckeri, Morr. Lvs. 10–20, oblong, pointed, canaliculate at base, very finely spiny, brownish green or rosy and spotted or striped with light green: fls. white.

L. H. B.

CRYPTOGAMS are flowerless plants, and they produce not seeds but spores. The whole vegetable kingdom has been split into two vast classes, the flowering plants or phanerogams and the flowerless ones or cryptogams. Cryptogam means "concealed nuptials," and phanerogam means "visible nuptials." These names were given when it was thought that the sexual parts of the flowerless plants were very minute or even wanting. The word is now falling into disfavor with botanists. Cryptogams are of less horticultural interest than the flowering plants, although they include the Ferns, and some interesting smaller groups, as Selaginellas, Lycopods or Club Mosses. Two other vast groups are the Seaweeds or Algæ, and the Fungi. For the edible Fungi, see *Mushrooms.* For parasitic Fungi, see *Diseases* and *Fungus.* For a general sketch of the Ferns and their allies, see *Ferns.*

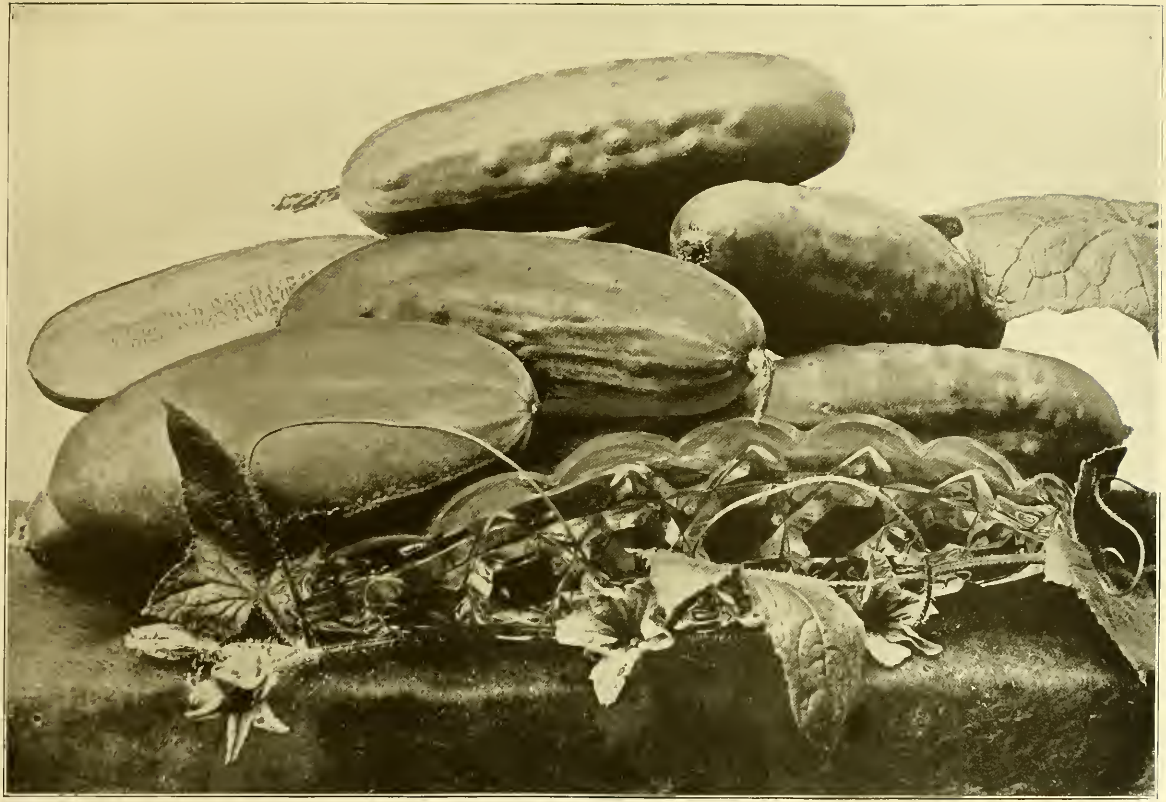


Plate VIII. The White Spine type of Cucumber
The most popular class in North America, both for the open and for forcing

CRYPTOGRÁMMA (Greek, *a concealed line*, alluding to the sub-marginal sori). *Polypodiàceæ.* A small genus of subalpine Ferns of both hemispheres. Lvs. of two sorts, the sporophylls contracted and the sori covered by the infolded margin of the segments, forming pod-like bodies. Besides our native species, a second one, *C. crispa*, is found in Europe, and a third in the Himalayas. Name often incorrectly written Cryptogramme. Culture easy.

acrostichoides, R. Br. ROCK-BRAKE. Height about 8 in.: lvs. 4–6 in. long, on tufted straw-colored stalks, tri-quadripinnatifid, with toothed or incised segments, the sporophylls with longer stalks, less divided and with pod-like segments. Canada to Colorado, California and northward. L. M. UNDERWOOD.

CRYPTÓLEPIS (Greek, *hidden scale*). *Asclepiadàceæ.* Glabrous shrubs, erect or twining, of tropical Asia and Africa. Lvs. opposite. Fls. in a loosely forking, few-fld. cyme. Calyx deeply 5-parted, with 5 scales at base. Corolla with spreading limb, the tube short-cylindrical or campanulate, the lobes 5 and linear, spreading or deflexed and twisted; corona of 5 scales attached at or near the middle of the tube. Follicles terete and smooth, spreading. Only cult. in S. Calif. and S. Fla. **C. Buchánani**, Roem. & Schult. A twining shrub with yellow fls., resembling those of an Echites. **C. longiflòra**, Regel. Dwarf and compact, growing with long lvs. tinted with red; tubular white fls., as in *Bouvardia jasminiflora*. Both species are from India.

CRYPTOMÈRIA (Greek, *kryptos*, hidden, *meros*, part; meaning doubtful). *Coniferæ.* Large pyramidal tree, with a straight slender trunk, covered with reddish brown bark and with verticillate spreading branches, ascending at the extremities: lvs. spirally arranged, linear-subulate, acute, slightly curved, decurrent at the base: fls. monœcious; staminate oblong, yellow, forming short racemes at the end of the branches, pistillate globular, solitary, at the end of short branchlets: cone globular, with thick, wedge-shaped scales, furnished with a recurved point on the back and with pointed lobes at the apex, each scale with 3–5 narrow-winged, erect seeds. One species in China and Japan, extensively planted for avenues, and as timber trees in the latter country, where the light and easily worked but durable wood is much used. It is hardy as far north as New York, and thrives in sheltered positions even in New England. It seems, however, in cultivation, not to assume the beauty it possesses in its native country. With us, it looks best as a young plant, when it much resembles the *Araucaria excelsa*. It is therefore sometimes grown in pots. It thrives best in a rich, loamy and moist soil and sheltered position. Prop. by seeds or by cuttings of growing wood, especially var. *elegans*, which grows very readily. The horticultural varieties are also sometimes increased by grafting.

Japónica, Don. Tree, attaining 125 ft.: lvs. linear-subulate, compressed and slightly 4- or 3-angled, bluish green, ½–1 in. long: cone brownish red, ¾–1 in. across. S.Z. 124. R.H. 1887, p. 392. Gng. 4:197. F.E. 10:510. G.F. 6:446.—Of the garden forms, the most desirable is var. **élegans**, Beissn. (*C. élegans*, Veitch). Low, dense tree, with horizontal branches and pendulous branchlets: lvs. linear, flattened, soft, spreading, longer than in the type, bright green, changing to bronzy red in fall and winter. Very handsome when young, but short-living. Var. **araucarioides**, Carr. Of regular pyramidal habit, with short, thick falcate lvs., resembling *Araucaria excelsa*. Var. **compácta**, Hort. Of very compact habit, with bluish green foliage. Var. **Lóbbi**, Carr. Of compact habit, with shorter and more appressed bright and deep green lvs. Var. **nàna**, Knight. Dwarf and procumbent, densely branched form; adapted for rockeries. Var. **spiràlis**, Veitch. Slender shrub, with strongly falcate lvs., twisted spirally around the branchlets. S.Z. 124, Fig. 4. ALFRED REHDER.

CRYPTOPỲRUM (Greek, *hidden wheat*). *Gramíneæ.* This genus includes a plant sometimes catalogued with ornamental grasses, but it is no more ornamental than a long-awned form of quack-grass would be. **C. Richardsoni**, Schrad. (*Agropỳrum Richardsoni*, Schrad.), is similar to *Agropyron caninum*, but has longer awns. It is leafy, and grows 1–1½ ft. high. P. B. KENNEDY.

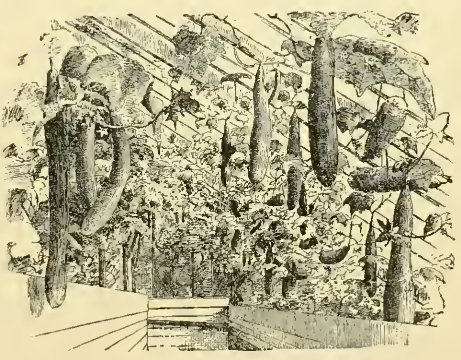
CRYPTOSTÈGIA (Greek, *krupto*, conceal, and *stego*, cover; referring to the 5-scaled crown in the corolla tube, which is not exposed to view). *Asclepiadàceæ.* A genus of only two species of tropical climbers, one from tropical Africa and one from Madagascar. The juice of *C. grandiflora*, when exposed to the sunshine, produces caoutchouc. The plant is cultivated in India for this purpose. It is rarely cultivated in Old World greenhouses for ornament. It is said to be of easy culture in a warm house and propagated by cuttings.

grandiflòra, R. Br. Stem erect, woody, branches twining: lvs. opposite, short-stalked, oblong, entire, 3 in. long, 1½ in. wide: fls in a forked raceme, reddish purple, becoming lilac or pale pink, about 2 in. across, twisted in the bud. Trop. Afr. B. R. 5:435.—Once cultivated at Oneco, Fla., by Reasoner.

CUCKOO FLOWER. *Cardamine pratensis.*

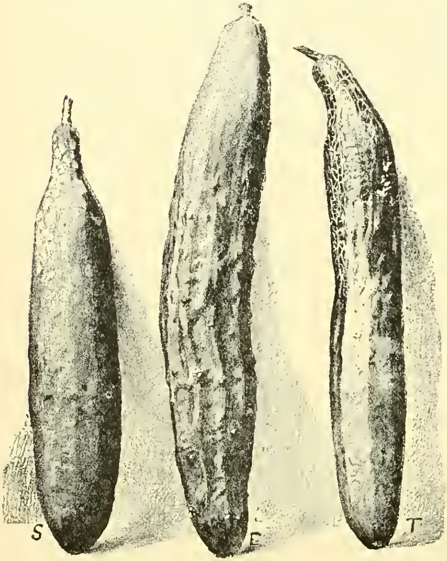
CUCKOO PINT. See *Arum.*

CUCUMBER. Plate VIII. The common Cucumbers are derived from a South Asian species, *Cucumis sativus* (see *Cucumis*), which has long been known in cultivation. The so-called West India Gherkin, which is commonly classed with the Cucumbers, is *Cucumis Anguria*. The Snake, or Serpent Cucumber is more properly a muskmelon, and should be designated botanically as *Cucumis Melo*, var. *flexuosus* (cf. Am. Gar. xiv. 206). The "Musk Cucumber" is *Cucumis moschata*, Hort. Probably this is identical with Concombre musqué, referred to *Sicana odorifera* by Le Potager d'un Curieux, known in this country as Cassabanana. The Mandéra Cucumber is *Cucumis Sacleuxii*, Paill. et Bois. (Pot. d'un Curieux), but it is not in cultivation in this country. None of these is of any particular importance except the common types of *Cucumis sativus*. These are extensively cultivated in all civilized countries as field and as garden crops. They come into commerce as pickles packed in bottles and barrels, and are very extensively used in this form. Of late, the forcing of Cucumbers under glass has come to be an important industry in the eastern states; and this industry seems to be rapidly increasing.



584. House of English Cucumbers.

Cucumbers will thrive in any good soil not extremely heavy nor sandy. Good corn or wheat land, if in gardening condition with respect to tilth and drainage, will answer. Or for the earliest crop, a situation with a more pronouncedly sandy soil may serve best. In most parts of America the field crop of Cucumbers may be grown from seed planted in the open ground after danger of frost is past. Put 6 to 12 seeds in the hill (having enough to provide against the ravages of insects), the hills being 4 by 6 feet apart. The early crop may often be planted in the same way, and protected for a time by a sash-covered frame placed over each hill. Plants are sometimes started in greenhouses or hotbeds, to be set later in the open ground; but this method is unsatisfactory unless great pains be taken. The method outlined by Henderson (Gardening for Profit), of starting plants on inverted sods in hotbeds and greenhouses, has proved successful with some gardeners, but is not capable of wide use. Early cultivation should be sufficient and timely, and accompanied by very careful combative operations against insects, for the first month is the most critical in the life of the Cucumber plant. When the vines begin to cover the ground, cultivation may be discontinued.



585. Three prominent varieties of English or Forcing Cucumber.
S, Sion House; *E*, Duke of Edinburgh; *T*, Telegraph.

Cucumbers are often forced in warmhouses (Fig. 584) in winter and spring. The large English forcing varieties, as Telegraph and Sion House (Fig. 585), are preferred by some growers, but the White Spine varieties are more popular in America, especially for spring forcing after lettuce or flowering plants. The plants are started in 3-inch pots, and transferred directly to the benches at intervals of 2½ to 3 feet. They are then trained on wire trellises near the roof. The English Cucumbers like a night temperature of 60° to 65°, and a day temperature of 70° to 75°. The White Spine varieties are less fastidious, and will take a somewhat lower temperature. In forcing Cucumbers, it is very important that the young plants should suffer no check from germination to fruitage. (Consult Bailey, Forcing-Book, and Cornell Bull. 31, and Munson, Me. Exp. Sta. Rept. 1896.)

Cucumbers for pickling should be gathered when quite small. In fact, their value as pickles seem to stand pretty much in inverse ratio to their size. Vines on which fruits are allowed to ripen cease bearing almost immediately. The young fruits may be successfully preserved in brine, from which they are soaked out with fresh water as wanted, and put into vinegar, which they readily absorb.

There are a great many varieties of Cucumbers in cultivation. This means that the group is variable, the varieties comparatively unstable, and varietal distinctions somewhat uncertain. Nevertheless, there are certain dominant types which may be separated, and around which most of the varieties may be conveniently classified. The principal types are the following:

Common Cucumber, *Cucumis sativus.*

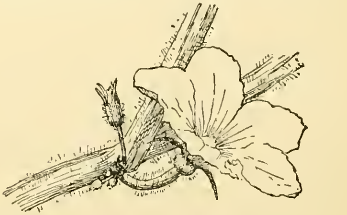
I. English forcing type (var. *Anglica*): Fig. 585. Large-leaved, strong-growing, slow-maturing plants, not suited to outdoor culture; fr. large, long, smooth, usually green, with few or early-deciduous black spines. Telegraph, Sion House, Noa's Forcing, Tailby's Hybrid, Kenyon, Lorne, Edinburgh, Blue Gown, etc.

II. Field varieties (Hill or Ridge Cucumbers).

- *a.* Black Spine varieties.
  1. Netted Russian type: Small, short-jointed vines, bearing more or less in clusters, small, ellipsoidal fr. covered with many small, black, deciduous spines; fr. green, ripening to dark reddish yellow, on a cracking, chartaceous skin. Early-maturing and prolific. Netted Russian, Everbearing, New Siberian, Parisian Prolific Pickle.
  2. Early Cluster type: Small or medium vines: fr. small, usually less than twice as long as thick, indistinctly ribbed, green, ripening yellow, with scattered, large, black spines. Early Cluster, Early Frame, Green Prolific.
  3. Medium Green type: Intermediate in size of vine and fr. between the last and next: fr. about twice as long as thick, green, ripening yellow, with scattering, large black spines. Nichol's Medium Green, Chicago Pickle.
  4. Long Green type: One of the best fixed types, representing, perhaps, one of the more primitive stages in the evolution of the group. Vines large, long and free-growing: fr. large and long, green, ripening yellow, with scattered, large, black spines. Long Green, Japanese Climbing.
- *b.* White Spine varieties.
  5. White Spine type: A strong and important type: plants medium large, vigorous: fr. medium large, about thrice as long as thick, green, ripening white, with scattering, large, white spines. There are many selected strains of White Spine. Cool and Crisp seems to belong here.
  6. Giant Pera type: Mostly poorly fixed varieties, having large, rather unthrifty vines, bearing large frs. tardily and sparsely, which are white or whitish, smooth or with scattering, deciduous, usually white spines. Chicago Giant, Goliath, Giant Pera, White Wonder, Long Green China.

Sikkim Cucumber, ***Cucumis sativus***, var. ***Sikkimensis***. Plant small and stocky, much like the common Cucumber: fr. large, reddish brown marked with yellow. (The Egyptian Hair Cucumber, of Haage & Schmidt, as we have grown it, is apparently an odd form of *Cucumis sativus*, and may belong here. It has a medium-sized white fr., densely covered with soft, white hair. The plant resembles the Sikkim Cucumber.) Not in general cult.

Snake or Serpent Cucumber, ***Cucumis Melo***, var. ***flexuosus***. Vines resembling those of muskmelon: fr. very long, twisted, ribbed-cylindrical, green, tardily yellowing, covered with dense, woolly hairs.

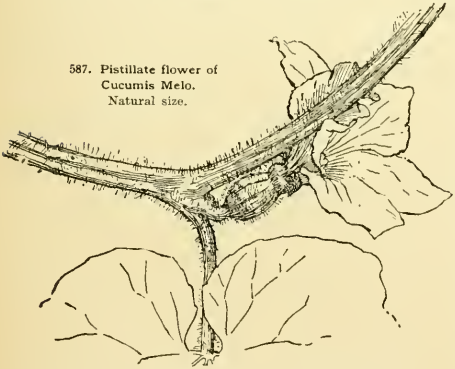


586. Staminate flower of Cucumis Melo.

West India Gherkin, *Cucumis Anguria*: Figs. 590, 591. Vines small and slender, somewhat resembling a slender watermelon plant: fr. very abundant, small, ellipsoid, covered with warts and spines, green, tardily whitening. Good for pickles.

These varieties are mostly all good for one purpose or another. The small sorts are naturally preferred for pickling, the medium sorts for slicing, and the large, late varieties for ripe fruits. The White Spine varieties are great favorites for slicing, and only less so for pickling.

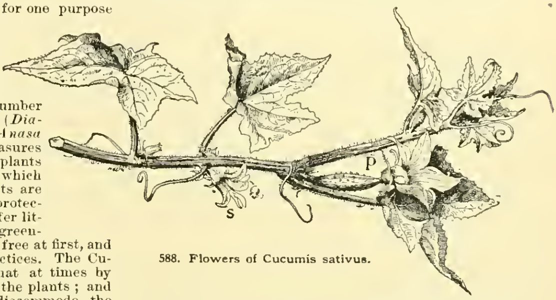
The unrelenting enemies of the Cucumber in the field are the Cucumber beetles (*Diabrotica*, spp.) and the squash bug (*Anasa tristis*). No effectual preventive measures are known except to cover the young plants with small wire or hoop frames, over which fine netting is stretched. If the plants are kept quite free from attack till these protectors are outgrown, they will usually suffer little damage. Plants started in hotbeds or greenhouses (see above) may usually be kept free at first, and this is the chief advantage of such practices. The Cucumber beetles are kept away somewhat at times by strewing tobacco stems thickly under the plants; and kerosene emulsion will sometimes discommode the young squash bugs without killing the vines, but usually not. "In the greenhouse, Cucumbers are liable to damage from mite, aphis, root-gall and mildew. For the mite, syringe the plant and pick off the infested lvs.; for aphis, use tobacco fumigation and pick infested lvs.; for root-gall, use soil which has been thoroughly frozen; for mildew, improve the sanitary conditions, and then use sulfur."—*Bailey, Forcing-Book.* F. A. Waugh.



587. Pistillate flower of Cucumis Melo. Natural size.

Forcing of Cucumbers.—The growing of Cucumbers under glass has become a large industry. Some years ago they were forced only in the spring, but to-day they are grown all the year round. The most difficult time is in the short days of winter. At such times there is always a good price for them and a brisk demand, and the prospect is as good for the future. The house may be even span and run either way, but many use two-thirds span, with the long way to the south. When they are continually grown year after year, it would be best to have double glass and double thick, but for early fall and late spring, one thickness of double glass is sufficient. The house may be any length desired. For heating, steam is the best, with pipes arranged so that they shall not be over 3½ ft. from either side of the house. Pipes 1¼ in. in diameter are large enough. Larger pipes give too much heat in one place.

The soil should be good loam, new soil preferred, from sod land. The plants are started in a box or small bed, where the temperature can be run to about 90°. In four or five days they will be ready to transplant into a bed in which the temperature of the soil is 70 to 80°. Place them 3 or 4 inches apart. In about ten days they will be large enough to transplant into pots. Six-inch pots are preferred, two plants in each. In two weeks they will be large enough to set in the house where they are to grow. The plants are set 3½ feet apart in the row and rows 6 to 7 feet, according to the size of the house. The vines should bear in four weeks. The crop depends upon the season. The spring-grown plants will produce double the crop of the fall- or winter-grown. The pollinating may be done with bees. One hive in a house of 24 by 100 feet, or in that proportion, will be sufficient. In midwinter, hand-pollination may be necessary.



588. Flowers of Cucumis sativus.

If grown properly, house Cucumbers are not often troubled with insects, but sometimes the green-fly comes upon them. In such cases, spray well with water, and smoke often. The mildew or spot sometimes appears, but never if the house has been taken care of properly. There is no real cure for these fungous diseases but to pull up the plants and begin again. Radishes or tomatoes can be grown with Cucumbers. If radishes are sown or transplanted in the house when the Cucumbers are set out, they will be off before the Cucumbers begin to bear; but all crops should be out of the house when the Cucumbers are bearing.

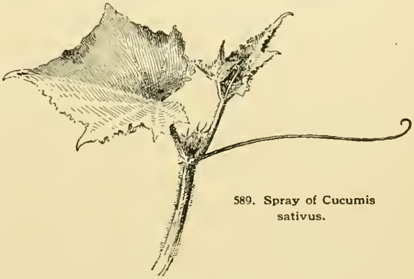
In this country, the White Spine type of Cucumber is mostly used for forcing, although the long English kinds are sometimes grown (particularly for home use).

W. W. Rawson.

CUCUMBER ROOT. Same as Indian Cucumber, *Medeola Virginica.*

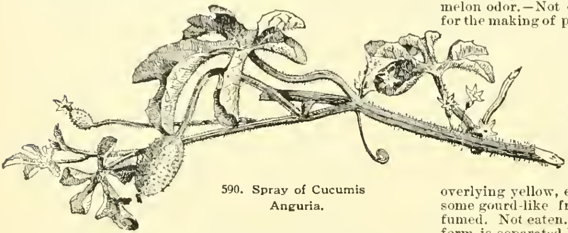
CUCUMBER TREE. See *Averrhoa* and *Magnolia.*

CÙCUMIS (old Latin name). *Cucurbitàceæ.* Sterile fls. in clusters, not long stalked, the fertile ones solitary and mostly short-stalked in the axils: corolla of 5 deep, acute lobes: stamens not united: stigmas 3, obtuse: tendrils simple. Herbaceous vines, of nearly 30 tropi-



589. Spray of Cucumis sativus.

cal species, mostly African and East Indian. The cult. species are annual. Monogr. by Cogniaux, DC. Monogr. Phaner. 3. See, also, Naudin, Ann. Sci. Nat. (Bot.) IV. 11: 9; 12: 108.



590. Spray of Cucumis Anguria.

A. *Fr. smooth (not spiny nor tuberculate) at maturity.*

Mélo, Linn. (*C. Momórdica*, Roxb. *C. utilíssimus*, Roxb.). Melon. Muskmelon. Figs. 586, 587. Long-running, hairy, prickly: lvs. round-heart-shaped or reniform, sometimes rounded-lobed: fr. in many sizes and shapes, the inner part being edible. S. Asia.—When forced under glass, the lvs. are usually more lobed. See *Melon.*

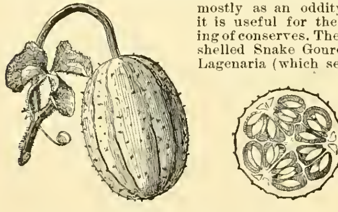
Var. **Cantalupénsis**, Naud. Cantaloupe. Rock Melons. Fruits mostly hard-rinded, more or less warty, scaly or rough, often deeply furrowed or grooved.—Name derived from Cantaluppi, near Rome, a former country seat of the Pope, whither this type of melons was brought from Armenia. In the U. S. the word Cantaloupe is often used as a generic name for Muskmelon, but it is properly a name of only one group of muskmelons—the hard and scaly-rinded (see Waugh, G. F. 8:183).

Var. **reticulàtus**, Naud. Nutmeg or Netted Melons. Fruits softer rinded, more or less netted, or sometimes almost plain or smooth.—Comprises the common muskmelons, aside from Cantaloupes.

Var. **saccharìnus**, Naud. Pineapple Melons. Comprising varieties of oblong shape and very sweet flesh. Not sufficiently distinct from the last.

Var. **inodòrus**, Naud. Winter Melons. Lvs. lighter colored, less hairy, narrower: frs. possessing little or none of the common muskmelon odor, and keeping long. The winter muskmelons are little known in this country, although they are worthy of popularity. Much cult. in parts of the Mediterranean region. See Bull. 96, Cornell Exp. Sta.

Var. **flexuòsus**, Naud. (*C. flexuòsus*, Linn.). Snake Melon. Snake Cucumber. Fr. many times longer than broad, greenish at maturity, variously curved and furrowed. A. G. 14: 203.—Fr. often 2–3 ft. long, and 1–3 in. in diameter. Grown mostly as an oddity, but it is useful for the making of conserves. The hard-shelled Snake Gourd is a Lagenaria (which see).



591. Fruit of Cucumis Anguria.

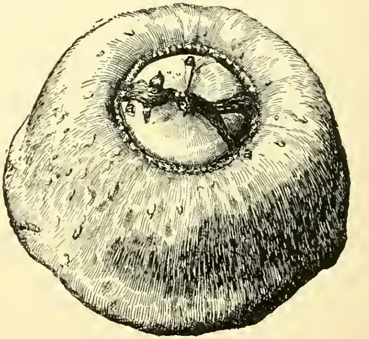
Var. **acidulus**, Naud. Cucumber Melon. Frs. oblong or cylindrical, mottled or unicolored, the flesh white and cucumber-flavored. No varieties in the Amer. trade are of this group, but they are occasionally seen in botanical gardens and experimental grounds, which import seeds of oriental plants.

Var. **Chìto**, Naud. (*C. Chìto*, Morr.). Orange Melon. Mango Melon. Melon Apple. Vine Peach. Garden Lemon. Vegetable Orange. Vine less robust than that of the Muskmelon, and lvs. smaller: fr. size, shape and color of an orange or lemon, without markings, with a white or pale yellow cucumber-like flesh, with no muskmelon odor.—Not edible in its natural state, but useful for the making of preserves (or "mangoes") and pickles. Name pronounced *keeto*. Cf. Bull. 15, Cornell Exp. Sta.; A. G. 14: 206.

Var. **Dùdaim**, Naud. (*C. Dùdaim*, Linn. *C. odoratíssimus*, Mœnch). Dudaim Melon. Pomegranate Melon. Queen Anne's Pocket Melon. Vine small, as in the last: fr. size and shape of an orange, somewhat flattened at the ends, very regular and smooth, marbled with longitudinal markings of cinnamon-brown overlying yellow, exceedingly fragrant.—A most handsome gourd-like fruit, and highly and deliciously perfumed. Not eaten. A nearly odorless and scarlet-rinded form is separated by Naudin as var. *erythræus*.

AA. *Fruit spiny or tuberculate.*

satìvus, Linn. Cucumber. Figs. 588, 589. Long-running, prickly: lvs. usually 3-lobed (or strongly angled), the middle lobe most prominent and often pointed: fr. prickly or muricate, at least when young, but in some varieties becoming smooth, mostly oblong, the flesh white. S. Asia. See *Cucumber.*



592. Young turban Squash, on which the remains of the corolla still persist.
The central part of the fruit is the ovary.

Var. **Ánglicus**. Figs. 584, 585. English or Forcing Cucumber. A product of cultivation and selection, within the last century (see Forcing-Book, pp. 192–4), distinguished from the common or field Cucumbers as follows: fruits (and ovaries) very long and slender, little if any furrowed, spineless or nearly so at maturity, nearly or quite green at maturity, comparatively few-seeded: fls. very large: lvs. very broad in proportion to their length, with shallower sinuses: vines very vigorous, with long and thick tendrils.

Var. **Sikkiménsis**, Hook.f., cult. in the Himalayan Mts., but not known to be in this country; has large 7–9-lobed lvs. and cylindrical-club-shaped fr. B.M. 6206.

dipsàceus, Ehr. (*C. erinàceus*, Hort.), Dipsaceous Gourd. Ostrich-Egg Gourd. Hedgehog Gourd. Plant and foliage like that of *C. Melo:* fls. long-stalked: fr. 1–2 in. long, oblong or nearly spherical, becoming hard and dry, densely beset with long scales or hairs, and looking like a bur. Arabia, Afr. R.H. 1860, p. 210. Cult. as an ornamental Gourd.

Angùria, Linn. (*C. grossulariæfórmis*, Hort.). Bur Cucumber.. West Indian Gherkin. Gooseberry Gourd. Figs. 590, 591. Stems slender, hispid: lvs. deeply cut into 3–5 narrow obovate or spatulate divisions,

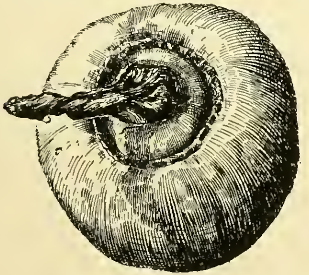
water-melon like: fls. small, the pistillate long-stalked: fr. 1–3 in. long, cucumber-like but more spiny. Supposed to be native to the Amer. tropics. B.M. 5817.—Cult. both for the oddity of its frts. and for the making of pickles. The Gherkins of mixed pickles, however, are young Cucumbers.

C. acutángulus, Hort.=Luffa.—*C. perénnis*, James=Cucurbita.

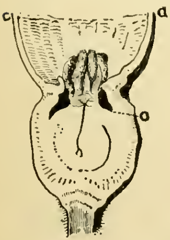
L. H. B.

CUCURBIT. A plant of the genus Cucurbita. Sometimes shortened to Cucurb.

CUCÚRBITA (classical name). *Cucurbitàceæ.* GOURD. PUMPKIN. SQUASH. Vine-like herbs, tendril-bearing, inhabitants of warm countries. Fls. monœcious, large, yellow, solitary in the axils, the staminate long stalked, the pistillate short-stalked: corolla 5-lobed: stamens 3, arising from the bottom of the fl., and united in a column: stigmas 3, but 2-lobed: ovary inferior, enclosing a hollow receptacle: tendrils 2–3 forked. About 10 species. The morphology of the Pepo or Gourd-fruit may be illustrated by the Turban Squash. (Figs. 592, 593, 594.) In this fruit, there is a "squash inside a squash." The inner part bears the corolla and the styles. It is the ovary. The corolla is attached about the edge of the inner Squash, as the withered remains in Fig. 592 show. Sometimes the withered corolla becomes detached, but hangs onto the withered remains of the stigmas, as in Fig. 593. The longitudinal section of the flower (Fig. 594) explains the structure. The corolla is shown at c d. The top of the ovary is at O. The stigmas are on the ovary. The part encircling the ovary (outside of O) is the hollowed receptacle. Ordinarily the receptacle is closed at the top, completely confining the ovary; but in the Turban Squashes the receptacle does not extend over the top of the ovary, and the ovary therefore protrudes. The older morphologists held this outer part of the Squash to be adnate calyx, rather than receptacle. The Cucurbits are monographed by Cogniaux, DC. Monogr. Phaner. 3. Also by Naudin, Ann. Sci. Nat. (Bot.) IV. vol. 6. See *Pumpkin* and *Squash*.



593. Young Turban Squash, in which the withered corolla has become detached, but hangs on the remains of the styles and stigmas.

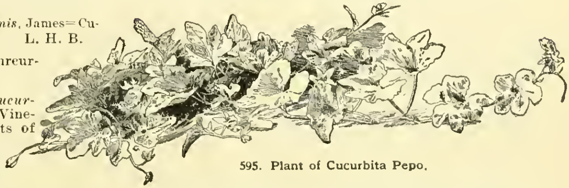


594. Section of Flower of Turban Squash.

Showing the ovary inside the hollowed receptacle.

A. *Lvs. lobed: stalks of fruits strongly ridged.*

Pèpo, Linn. (*C. Melopèpo*, Linn.). PUMPKIN. Figs. 595, 596. Annual: long-running, prickly on stems and petioles: lvs. 3–5-lobed, dark dull green: corolla-tube widening upwards, the pointed lobes erect: calyx-lobes narrow, not leaf-like: peduncle very hard and deeply furrowed when mature, not enlarging next the fr.: the fr. very various in form, color, season, size.—Probably native to trop. Amer., but unknown wild. Cult. by the Indians when Amer. was discovered, in fields of maize. For studies in the nativity of the Pumpkins and Squashes, see De Candolle, Origin of Cultivated Plants; Gray and Trumbull, Amer. Journ. Sci. 25: 372; Sturtevant, Amer. Nat. 1890: 727; Wittmack, Ber. der Deutschen Bot. Gesell. 6: 378 (1888).



595. Plant of Cucurbita Pepo.

Var. **condénsa.** BUSH PUMPKINS. SCALLOP and SUMMER CROOKNECK SQUASHES. Plant compact, little or not at all running. Of horticultural origin.

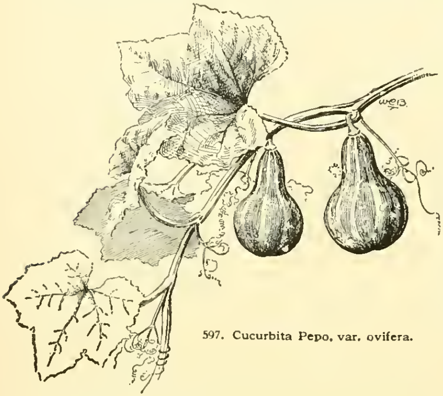
Var. **ovifera.** (*C. ovífera*, Linn.). GOURD. Fig. 597. Plant slender, running: lvs. smaller than in *C. Pepo*, usually very prominently lobed: fr. small, hard and inedible, egg-shaped, globular, pear-shaped, oblate, often striped. R.H. 1894, p. 429.—Sold in many vars. by seedsmen, under the names of *C. Pepo* vars. *pyriformis*, *depressa*, *annulata*, etc. See *Gourd*.

moschàta, Duchesne (*C. melonæfórmis*, Carr.). CUSHAW. CHINA, CANADA CROOKNECK and WINTER CROOKNECK SQUASHES. Figs. 598, 599, 600. Annual: long-running, less prickly and sometimes soft-hairy: lvs. more rounded than those of *C. Pepo*, but lobed, often grayish: fl. with a widening tube, and large, erect lobes: calyx-lobes large, often leaf-like: peduncle becoming deeply ridged and much enlarged next the fr. Possibly of East Asian origin.

596. Stem of Cucurbita Pepo—Early Sugar Pumpkin.

AA. *Lvs. not lobed (except sometimes on young shoots): stalks of fruits not prominently ridged.*

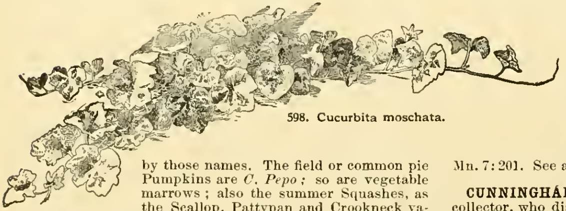
máxima, Duchesne. SQUASH. Figs. 601–604. Annual: long-running, the stems nearly cylindrical, little prickly and often hairy: lvs. orbicular or kidney-shaped, commonly not lobed, the basal sinus wide or narrow, the margin shallowly apiculate-sinuate: corolla-tube nearly the same diam. at top and bottom (Figs. 602, 603), the corolla-lobes large and soft, and wide-spreading or drooping: peduncle at maturity soft and spongy, not ridged nor prominently enlarged next the fr.: fr. very various, but not light yellow nor warty nor crookneck-shaped, usually late-ripening, the flesh orange and not stringy. Probably American.



597. Cucurbita Pepo, var. ovifera.

fœtidíssima, Kunth (*C. perénnis*, Gray. *Cùcumis perénnis*, James). Fig. 605. Perennial: long-running, scarcely prickly: lvs. large, cordate-triangular, grayish pubescent, the margin shallowly apiculate-crenate: fl. nearly as large as in *C. Pepo* and similar in shape, the pistillate on a peduncle 2–3 in. long: fr. size and shape of an orange, smooth, green and yellow splashed, not edible. Sandy, arid wastes, Neb. and Colo. to Tex. and Mex. and westward to Calif. R. H. 1855: 61; 1857, p. 54.—In its native haunts, the root is tuberous, 4–7 in. in diam. and penetrating the earth 4–6 ft. Roots at the joints. The plant has a fetid odor. Sold by seedsmen as a gourd, but the fruit does not often ripen in the northern states. Useful on arbors and small trees, when coarse vines are wanted

The terms Squash and Pumpkin are much confused. In Europe, the large varieties of *Curcubita maxima* are known as Pumpkins, but in this country the fruits of this species are known usually as Squashes. In America, the words Pumpkin and Squash are used almost indiscriminately, some varieties in all species being known by those names. The field or common pie Pumpkins are *C. Pepo*; so are vegetable marrows; also the summer Squashes, as the Scallop, Pattypan and Crookneck varieties. The Hubbard, Marblehead, Sibley and Turban kinds are *C. maxima*. The Cushaws, Canada Crookneck, Japanese Crookneck, Dunkard, and Sweet Potato Pumpkins (or Squashes) are *C. moschata*. The fruit stem (as shown in Figs. 596, 599, 604) is a distinguishing characteristic of the ripe fruits. *C. Pepo* and *C. maxima*, and *C. maxima* and *C. moschata* do not intercross. *C. Pepo* and *C. moschata* have been crossed, but it is doubtful if they intermix when left to themselves. In Europe, the word Gourd (or its equivalent in various languages) is used generically for Cucurbitas; but in this country it is restricted mostly to the small, hard-shelled forms of *C. Pepo* (var. *ovifera*) and to *Lagenaria vulgaris*.



598. Cucurbita moschata.

L. H. B.

CUDRÀNIA (derivation unknown). *Urticàceæ.* Trees or shrubs, with deciduous, alternate, stipulate petioled lvs.: fls. diœcious, in globular heads: collective fr. globular. About 3 species, in S. and E. Asia and trop. Austr., of which only one is sometimes cultivated. It requires protection in the north, and is usually prop. by greenwood cuttings in summer under glass.

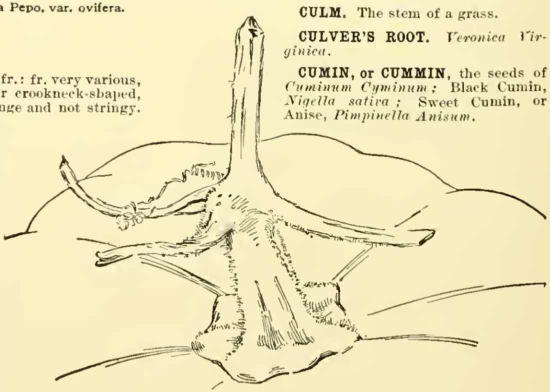
tricuspidàta, Bureau (*Maclùra tricuspidàta*, Carr.). Shrub, with slender, spiny branches: lvs. elliptic-ovate, acuminate, entire, sometimes 3-lobed at the apex, nearly glabrous, 1½–3 in. long: fl.-heads axillary, on short peduncles: fr. globose, about 1 in. across. China. R. H. 1864, p. 390.—Much resembling Maclura, and of no special decorative value.

Alfred Rehder.

CULM. The stem of a grass.

CULVER'S ROOT. *Veronica Virginica.*

CUMIN, or CUMMIN, the seeds of *Cuminum Cyminum*; Black Cumin, *Nigella sativa*; Sweet Cumin, or Anise, *Pimpinella Anisum*.



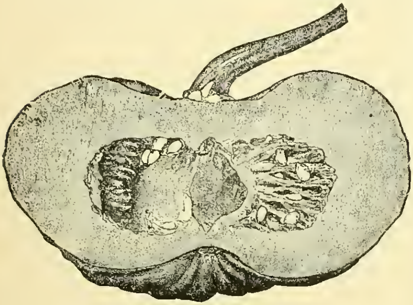
599. Stem of Cucurbita moschata—Large Cheese Pumpkin.

CUNÌLA (origin unknown). *Labiàtæ.* This genus contains a low-growing, tufted, hardy, native perennial plant, rarely cultivated in borders for its profusion of small, white or purplish, 2-lipped flowers, which are borne in corymbed cymes or clusters. The genus contains not more than 16 species, 2 North American, 2 Mexican, and the rest Brazilian. They are somewhat woody, and usually have small lvs.: the whorls of flowers are sometimes loosely corymbose, sometimes axillary, few-fld., much shorter than the lvs., sometimes many-fld., in dense spikes or terminal heads; calyx 10–13-nerved, 5-toothed: perfect stamens 2.

Marìàna, Linn. Maryland Dittany. Height 1 ft.: lvs. smooth, ovate, serrate, rounded or heart-shaped at the base, nearly sessile, dotted, 1 in. long. Dry hills, southern N. Y. to S. Ind., south to Ga. and Ark. J. H. III. 35: 321. Mn. 7: 201. See also *Dittany*.

CUNNINGHÁMIA (after J. Cunningham, botanical collector, who discovered this Conifer 1702 in China). *Coniferæ.* Tree, with stout trunk and verticillate, spreading branches, pendulous at the extremities: lvs.

linear-lanceolate, rigid, densely spirally arranged and 2-rowed in direction: fls. monœcious; staminate oblong, pistillate globose, in small clusters at the end of the branches: cones roundish-ovate, 1–2 in. long, with roundish-ovate, serrate and pointed, coriaceous scales, each with 3 narrow-winged seeds at the base. One species, in China. A very decorative Conifer for warmer temperate regions, much resembling the *Araucaria Brasiliensis*. It prefers a half-shaded position and sandy and loamy, humid soil. Prop. by seeds or cutting of half-hardy wood in late summer under glass; short sprouts from the old wood of the trunk or larger branches are the best; cuttings from lateral branches grow into weak and one-sided plants.


600. Fruit of Cucurbita moschata—Tonasu, a Japanese variety.

Sinénsis, R. Br. (*C. lanceolàta*, Lamb.). Tree, attaining 80 ft.: lvs. linear-lanceolate, with broad, decurrent base, sharply pointed, finely serrulate, light green and shining above and with two broad, whitish bands beneath, 1½–2½ in. long: cones 1–2 in. high. China, cult. in Japan. B.M. 2743. S.Z. 104, 105. ALFRED REHDER.

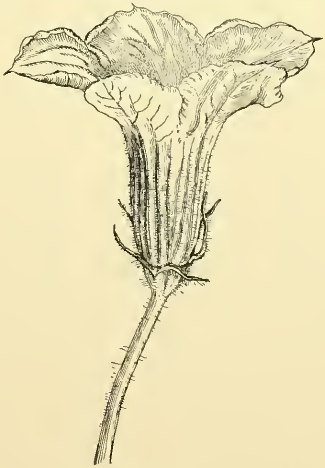
CUPÀNIA (after Francis Cupani, Italian monk, author of Hortus Catholicus, died 1710). *Sapindàceæ*. A rather large and ill-defined genus of trees and shrubs, the most important of which is the Akee tree, naturalized in the West Indies from western Africa, which has rich, red edible fruits that are much improved by cooking. The flowers are so fragrant as to deserve distilling. The tree reaches a height of 30 ft., and is cultivated in Jamaica to a height of only 3,000 ft., but can endure a slight frost. It is also cult. in So. Fla. *C. sapida* is now referred to Blighia by reason of its long-exserted stamens and scale longer than the petals. *C. anacardioìdes*, a rapid-growing tree with edible fruit, has been introduced into S. Calif. by Franceschi.

sápida, Voigt (*Blìghia sápida*, Kon.). AKEE TREE. Leaflets 3 or 4 pairs, ovate-lanceolate, veined: fls. whitish.

C. elegantissima, Hort., was once advertised by Pitcher & Manda as an ornamental warmhouse plant "with handsome leaves and racemes of white flowers."

CÙPHEA (Greek, *curved;* referring to the prominent protuberance at the base of the calyx tube). *Lythràceæ*. An exceedingly interesting genus of tropical and subtropical American herbs and shrubby plants, with remarkable variations in the petals. In *C. ignea*, perhaps the most attractive of the group, the petals are entirely absent, and the showy part is the brilliantly colored calyx tube. At the other extreme is *C. hyssopifolia* with 6 petals (the normal number in the genus), and all of equal size. Between these two extremes (shown in Figs. 606 and 608) are at least two well marked intermediate types. One of these (exemplified in *C. procumbens*) has 2 large and 4 small petals: the other, (*C. Llavea*), has 2 conspicuous petals, and the other 4 are completely abortive. These two types are unique among garden plants. The series of intergradient forms is completed by *C. cyanea*, in which there are only 2 petals, and these minute, and *C. micropetala*, in which there are 12 barely visible petals, alternating with and shorter than the calyx teeth. The genus is badly in need of thorough botanical revision. The plants are often clammy: lvs. opposite, rarely whorled or alternate, ovate, lanceolate, or linear, entire. The flowers are often borne in one-sided racemes, and some of the species have a very odd look from the bold angle made by the slender ascending pedicel and the descending calyx tube, with its queer projection at the base. The purple stamens add to the interest. Nearly all Cupheas are grown from seed and treated as tender annuals, but *C. ignea* is chiefly prop. by cuttings. They are of easy culture, and the whole series is worth growing. In addition to the species described below, *C. Hookeriàna*, Walp., is cult. as *C. Rœzlii*, Carr. It has lanceolate lvs., with vermilion and orange calyx. R.H. 1877:470.

601. Cucurbita maxima.


602. Staminate flower of Cucurbita maxima—Hubbard Squash (× ⅔).

A. *Petals 6, but very minute and inconspicuous.*

micropétala, HBK. (*C. éminens*, Planch. & Linden). Stem shrubby, more or less branched: 1–2 ft. high: branches and calyx scabrous: lvs. oblong-lanceolate, acute at both ends, but without a distinct petiole, rigid, scabrous: fls. borne singly in succession at a point above the axils, which distinguishes this species from all others here described; petals 6, minute, borne between the calyx teeth, and shorter than them; calyx 12-

toothed, scarlet at the base, yellow towards the top, greenish at the mouth; stamens and filaments red: ovary 2-celled, many-seeded. Mex. HBK. Nov. Gen. Sp. 6, p. 209, t. 551. R.H. 1857, p. 151. F.S. 10:994 (1854).—The picture first cited shows a 1-sided raceme, the second a panicle and the third a common raceme. In this species the calyx tube is the attractive portion, while the petals are inconspicuous. The tube is not 2-lipped, but almost regular.

603. Pistillate flower of Cucurbita maxima – Hubbard Squash (×⅔).

604. Stem of Cucurbita maxima—Hubbard Squash.

AA. *Petals 6, all conspicuous, but 2 of them much larger than the rest.*

procúmbens, Cav. Annual, herbaceous, 1 in. high, procumbent, sticky-pubescent, with characteristic purplish hairs: lvs. ovate-lanceolate, with white hairs, 1½–3 in. long, gradually decreasing in size until they become bract-like, petiole short: fls. numerous, peduncles longer than the petioles, 2 or 3 times shorter than the calyx; calyx 6-toothed, purplish at the base, green at the tip, with 12 raised streaks, and a pubescence like that of the stem; petals 6, the 2 larger ones on the upper lip of the calyx purple; filaments included. Mex. B.R. 3:182. *C. purpùrea*, Hort. F. S. 4:412. R.B. 22:85; said to be a hybrid between *C. miniata* and *C. viscossima*, is probably not distinct.

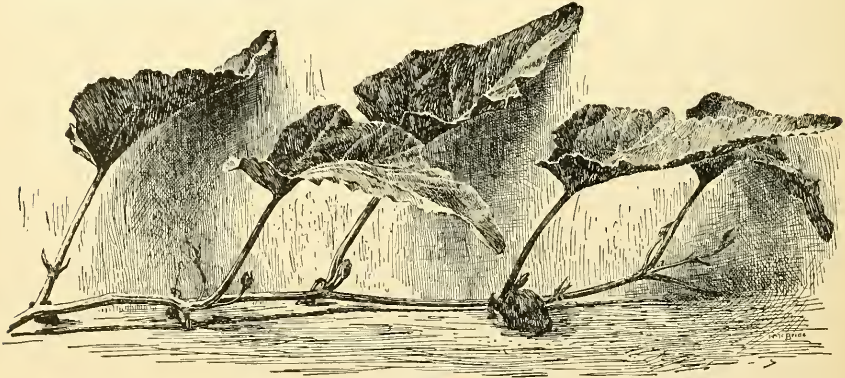
AAA. *Petals 6, all of the same size.*

hyssopifòlia, HBK. Fig. 606. Stem shrubby; branches numerous, strigose; lvs. lanceolate, rather acute, obtuse at the base, glabrous above, strigose-pilose along the midrib and veins, as may be seen with a hand lens: fls. with their slender pedicels scarcely longer than the lvs.; calyx glabrous; petals 6, somewhat unequal, dilute violet; stamens 11 included; filaments villous: ovary 5–6-seeded. Mex.—*C. hyssopiphýlla*, Hort., Pitcher & Manda, is presumably a typographical error. This is the least attractive of the species here described, and is no longer advertised, but it still lingers in a few conservatories. It is easily told from its showier relatives by its much smaller lvs. (less than ½ in. long) and much branched and very woody appearance.

AAAA. *Petals normally 2, the other 4 abortive.*

B. *Size of petals very small.*

cyànea, Moc. & Sesse. (*C. strigulòsa*, Hort., not HBK.). Stem herbaceous, erect: branchlets hispid: lvs. opposite, stalked, ovate, cordate, acuminate, villous on both sides: peduncles alternate, racemose: calyx slightly hispid, scarlet at the base, yellow at the top: petals 2, clawed, spatulate; anthers and petals violet-blue. Mex. B.R. 32:14 (1846) as *C. strigillòsa*, Lindl. F.S. 1:15 & P.M. 11:241 as *B. strigulòsa*, but neither of these plates is the *C. strigulòsa*, HBK., which is a different species, with a shrubby stem: branches and calyx clammy-hispid: lvs. ovate-oblong, acute at both ends, clammy, glabrous above, strigose-scabrous below: petals nearly equal: ovary about 8-ovuled.


605. Cucurbita fœtidissima.

BB. *Size of petals larger.*

C. *Calyx 6-toothed.*

Llàvea, Lindl. Red, White-and-Blue Flower. Fig. 607. Stems numerous, herbaceous, hispid: branches ascending: lvs. almost sessile, especially near the top, ovate-lanceolate, strigose: racemes short, few-fld.: calyx green on the ventral side, purple on the back and at the oblique-6-toothed mouth; petals 2 large, scarlet, obovate, the other 4 abortive; stamens 11. Guatemala. B.R. 16:1386. J.H. III. 31:305.—It is doubtful whether the plant described by Lindley is the same as the Mexican plant originally described by Lexarsa, which was said to have petals of "dilute scarlet." Lindley's plant had a green calyx, but the plant in the trade is colored. Used for baskets and bedding. Often misspelled *Llavæ.*

CC. *Calyx 12-toothed.*

miniàta, Brongn. Stem shrubby, erect: branches few, hispid: lvs. opposite, the upper ones not quite opposite, with a very short petiole, ovate, acute, entire, with white, silky hairs which are denser beneath: fls. solitary, subsessile, axillary, the peduncle adnate to the branch in such a way as to appear between and below the petioles: raceme few-fld., one sided. F.S. 2:73. P.M. 14:101. R.H. 1845:225. R.B. 22:85.—Var. **compácta**, Hort. S.H. 2:43. Gt. 46, p. 637. This is referred to *C. Llavea*, Lex., by Index Kewensis. The above description is from the original one in F.S. 2:73. Van Houtte describes several hybrid varieties in F.S. 5, p. 487, which differ chiefly in size, color, and marking of petals. Calyx 1 in. long, hispid, green at the base, purple above, 12-toothed at the tip: petals 2, scarlet, wavy. The specific name *miniata* means cinnabar-red, and refers to the petals.

AAAAA. *Petals none.*

ígnea, DC. (*C. platycéntra*, Hort., not Benth.). Fig. 608. Branches somewhat angled: lvs. petioled, ovate-lanceolate, acuminate, narrowed at the base, lightly scabrous: flower stalks 2–4 times longer than the leaf stalks: calyx glabrous, shortly 6-toothed, bright red except at the tip, which has a dark ring and a white mouth: petals none: stamens 11 or 12, glabrous. Mex. F.S. 2:180 (1846). P.M. 13:267 (1846).—This is sold only as *C. platycentra*, although De Candolle corrected the error in 1849 (F.S. 5:500 C.). This is a remarkable instance of the persistence of erroneous trade names.

W. M.

606. Cuphea hyssopifolia (× ½).

CUPULE. The husk or cup of an acorn. The oak belongs to the Cupuliferæ.

CUPRÉSSUS (ancient Latin name from Greek, *Kuparissos*). Cypress. Trees, rarely shrubs, with aromatic evergreen foliage: branchlets quadrangular or nearly so: lvs. opposite, small, scale-like, appressed, minutely denticulate-ciliate, on young seedling plants linear-subulate and spreading: fls. monœcious, minute, solitary on short branchlets; staminate ovate or oblong, yellow; pistillate subglobose: cones globular or nearly so, consisting of 3–7 pairs of ligneous, peltate scales, with a mucro or boss on the flattened apex, each bearing many or numerous seeds, but the lower scales usually sterile and smaller; they ripen the second year. About 10 species in C. Amer., north to Calif. and Ariz., and from S. Eu. to S. E. Asia. By some botanists, the allied genus Chamæcyparis is included. Highly ornamental evergreen trees, greatly varying in habit, only hardy in Calif. and the Gulf states. The hardiest seems to be *C. Macnabiana*, which will stand many degrees of frost in a sheltered position; also *C. macrocarpa*, *C. Arizonica*, *C. sempervirens*, *funebris* and *torulosa* are of greater hardiness than the others. They stand pruning well, and some species are valuable for hedges, *C. macrocarpa* being especially extensively planted for this purpose in Calif. The Cupressus seems to be less particular in regard to soil and situation, but prefers a deep, sandy-loamy soil. For prop., see *Chamæcyparis*. The young plants should be removed several times in the nursery to secure a firm root-ball, otherwise they will not bear transplanting well. Monogr. by M. T. Masters in Journ. of Linn. Soc. 31:312–351 (1895).

607. Cuphea Llavea.
Natural size.

Index: Arizonica, 5; Benthami, 6; Corneyana, 7; fastigiata, 1; funebris, 9; Goveniana, 4; Guadalupensis, 2; horizontalis, 1; Knightiana, 6; Lambertiana, 2; *Lawsoniana*, see Chamæcyparis; *Lindleyi*, 6; Lusitanica, 8; Macnabiana, 3; macrocarpa, 2; majestica, 7; sempervirens, 1; torulosa, 7.

A. *Branches and branchlets erect or spreading; branchlets short and usually rather stout.*

B. *Cones 1–1½ in. across, with 8–14 scales.*

1. **sempérvirens**, Linn. Tree, to 80 ft., with erect or horizontal branches and dark green foliage: lvs. closely appressed, ovate, obtuse, glandular: cones oblong or nearly globose; scales 8–14, with a short boss on the back. S. Eu., W. Asia. Var. **fastigiàta**, Beissn. (*C. fastigiàta*, DC.). With erect branches, forming a narrow, columnar head. The classical Cypress of the Greek and Roman writers, much planted in S. Eu. Var. **horizontàlis**, Gord. (*C. horizontàlis*, Mill.). Branches horizontally spreading, forming a broad, pyramidal head.

2. **macrocárpa**, Hartw. Monterey Cypress. Tree,

608. Cuphea ignea (× ⅓).

to 40 ft., occasionally to 70 ft., with horizontal branches, forming a broad, spreading head: branchlets stout: lvs. rhombic ovate, obtuse, closely appressed, not or obscurely glandular, dark or bright green: cones globular or oblong; scales 8–12, with a short, obtuse boss on the back. Calif., south of Bay of Monterey. S.S. 10:525. P.F.G. 1., p. 167. F.S. 7, p. 192 (as *C. torulosa*). G.C. III. 22:53. Gn. 53, p. 219. G.F. 7:245. Var. **Crippsi,** Mast. Lvs. spreading, light glaucous. A juvenile form. Var. **fastigiàta,** Knight. Of narrow, pyramidal, fastigiate habit. Var. **Guadalupénsis,** Mast. (*C. Guadalupénsis*, Wats.). Branches spreading: lvs. very glaucous: cones subglobose. Guadalupe Isl. G.C. III. 18:62. Var. **Lambertiana,** Mast. (*C. Lambertiàna*, Carr.). Dark green form with spreading branches. Var. **lùtea,** Hort., has yellow foliage.

BB. *Cones ½–1 in. across, with 6–8 scales.*

3. **Macnabiàna,** Murray. Fig. 609. Shrub with several stems, or small tree, to 20 ft., forming a dense, pyramidal head: lvs. ovate, obtuse, thickened at the apex, glandular, dark green or glaucous: cones oblong, ¾–1 in. high; scales usually 6, with prominent conical and curved bosses on the back. Calif. S. S. 10:528. R.H. 1870, p. 155. G.C. III. 9:403.

4. **Goveniàna,** Gord. Tree, to 50 ft., with slender, erect or spreading branches, forming a broad, open or pyramidal head: branchlets slender: lvs. ovate, acute, closely appressed, inconspicuously glandular: abundant staminate fls. in spring: cones subglobose or oblong; scales 6–8, with short, blunt bosses. Calif. S. S. 10:527. Var. **compácta,** André. Of compact, pyramidal habit. R.H. 1896, p. 9. Var. **glaùca,** Carr., with glaucous, and var. **viridis,** Carr., with bright green foliage.

609. Cupressus Macnabiana.
From a cultivated tree.

5. **Arizónica,** Greene. Tree, to 40, rarely to 70 ft., with horizontal branches, forming a narrow, pyramidal or broad, open head: branchlets stout: lvs. ovate, obtuse, thickened at the apex, inconspicuously glandular, very glaucous: cones subglobose, ¾–1 in. across; scales 6–8, with stout, pointed, often curved bosses. Ariz., Calif. S.S. 10:526. G.C. III. 18:63.

6. **Bénthami,** Endl. Tree, to 70 ft., with horizontal branches, forming a pyramidal head: branchlets slender: lvs. ovate-obtuse or acute, keeled and somewhat thickened at the apex, inconspicuously glandular, bright green: cones globular, ½–¾ in. across; scales 6–8, with short-pointed bosses. Mex. Var. **Lindleyi,** Mast. (*C. Lindleyi*, Klotzsch). Branchlets regularly arranged, of nearly equal length: cones small, with small-pointed bosses. Var. **Knightiàna,** Mast. Branchlets very regularly arranged, fernlike, drooping, glaucous: cones with stout, conical-pointed bosses. G.C. III. 16:669.

AA. *Branchlets slender, more or less pendulous: lvs. usually acute and keeled, not thickened at the apex: cones about ½ in. or less across* (see also *C. Benthami*).

7. **torulòsa,** Don. Tall, pyramidal tree, to 150 ft., with short, horizontal branches, ascending at the extremities: branchlets slender, drooping: lvs. rhombic-ovate, acute, appressed or slightly spreading at the apex, bright or bluish green: cones globular, nearly sessile, about ½ in. across; scales 8–10, mucronate. Himal. Var. **Corneyàna,** Mast. (*C. Corneyàna*, Knight). With distinctly pendulous branches: cones oblong, larger. Var. **majéstica,** Gord. (*C. majéstica*, Knight). Of more vigorous growth, with drooping branchlets, greyish green.

8. **Lusitánica,** Mill. Tree, to 50 ft., with spreading branches and more or less pendulous branchlets: lvs. ovate, acute, glaucous: cones pedicelled, about ½ in. across, covered with glaucous bloom; scales 6–8, with conical pointed bosses. Habitat unknown; much cult. in southwestern Eu. G.C. III. 10:761.—With several varieties.

9. **funèbris,** Endl. Tree, to 60 ft., with wide-spreading, pendulous branches and branchlets, branchlets slightly flattened: lvs. deltoid-ovate, acute, light green, often slightly spreading at the apex: cones short, peduncled, globose, about ⅓ in. across; scales 8, with a short mucro. China. P.F.G. I. p. 47, fig. 31. G.C. 1850:439. F.S. 6, p. 91.

C. Califórnica, Carr.=C. Goveniana.—*C. Cashmeriàna*, Hort. =C. torulosa.—*C. élegans*, Hort.=C. Benthami, var. Knightiana.—*C. ericoìdes*, Hort.=Thuya orientalis, var. ericoides.—*C. glandulòsa*, Hook.=C. Macnabiana.—*C. glaùca*, Lam.=C. Lusitanica.—*C. Hartwegi*, Carr.=C. macrocarpa.—*C. Karwinskyàna*, Regel=C. Benthami.—*C. Nepalénsis*, Loud.=C. torulosa.—*C. péndula*, L'Her.=C. Lusitanica.—*C. péndula*, Staunt.=C. funebris.—*C. Sinénsis*, Hort.=C. Lusitanica.—*C. thurífera*, HBK. Tree with spreading branches: lvs. oblong-lanceolate, upright-spreading, not closely appressed: cones globose, about 1 in. across, with slightly mucronate scales.—*C. thurifera*, Auth.=C. Benthami.

ALFRED REHDER.

CURCULÌGO (Latin, *curculio*, weevil; referring to the beak of the ovary). *Amaryllidàceæ.* This genus contains an uncommon foliage plant with the habit of a young palm and a curious floral structure. The genus is closely related to Hypoxis, but differs in its succulent indehiscent fruit, and because in many species the ovary has a long beak which looks like a perianth tube, but this beak is always solid, and bears upon its summit the style, which is in the center of the perianth. The following species is grown south and north, being used by florists for vases, jardinieres, and general decorative work, and also used outdoors in summer. It is of easy culture, but requires perfect drainage, and is prop. by suckers or division.

The Curculigos are exceedingly ornamental plants for large greenhouses, where a high temperature is maintained. To have them looking their best they should, if possible, be planted out in a bed, where they will attain a height of 5 feet. Their gracefully arching leaves are so constructed that they move continually from side to side with the slightest movement of the air. The variety *variegata* is one of the best variegated-leaved plants. While not so robust as the green form, it is more adapted to pot-culture. The soil should be two parts loam and another of rotted cow-manure and sand. Drainage must be carefully arranged, as the plants need an abundance of water. The green-leaved kind stands the summers well in the neighborhood of Washington, if protected from the sun and afforded an abundant supply of water.

Propagation is by division. The pieces, before potting, will make new roots rapidly if placed in the sand bed of a warm propagating house for a few days.

recurvàta, Dryand. Height 2½ ft. or more: root tuberous: lvs. from the root, 1–3 ft. long, 2–6 in. wide, with a channelled stalk one-third or one-fourth the length, the blade lanceolate, recurved, plated: scapes about as long as the leaf-stalks, covered with long, soft brown hairs, recurved at the end, bearing a head of drooping yellow fls., each ¾ in. across: bracts one to each fl., and about as long. Trop. Asia, Australia. B.R. 9:770. Var. **striàta,** Hort., has a central band of white. Var. **variegàta,** Hort., has longitudinal bars of white.

G. W. OLIVER and W. M.

CÚRCUMA (Arabic name). *Scitamináceæ.* A much neglected group of curious and showy warmhouse herbaceous plants with great spikes composed of large concave or hooded bracts, from which the flowers scarcely protrude their gaping mouths. These fleshy bracts are perhaps the showiest feature of the plant, the topmost ones being colored with gorgeous tropical hues. One species was once advertised by John Saul, but all the others mentioned below are equally interesting. These curious subjects are almost unknown in American conservatories, but with the spread of private greenhouses in America they will surely be grown, at least in some of the finer fanciers' collections. The following cultural points are taken from B. M. 4435, where it is said that these plants are of ornamental appearance, even when not in flower. In spring the tubers should be deprived of last year's mold and repotted in a fresh mixture of light loam, leaf-mold and turfy peat, the pots being well drained, and placed in a warm pit or frame in bottom heat. Water should be given sparingly until after the plant has made some growth. The young roots are soft and succulent, and are likely to rot if the soil remains wet for a long time. After flowering, the leaves soon show signs of decay, and water should be gradually withdrawn. During the resting period the soil should not be allowed to get dust-dry, or the tubers are likely to shrivel. The plants are propagated by dividing the tubers in spring. The flowers of Curcuma are large and gaping, hooded above, and with a 3-toothed lower lip. In the throat are seen 2 teeth, which are the tips of the anthers. Curcumas are essentially tropical plants, and the great difficulty is said to be to maintain sufficient heat while allowing them enough air.

610. Common Currant—Ribes rubrum, in bloom (× ½).

cordàta, Wall. Lvs. 1 ft. long, sheathing, ovate-cordate, acuminate, the same color on both sides, obliquely penninerved: bracts in a cylindical spike, the upper part forming a sterile portion called a coma, which is a rich violet, with a large blood-colored spot: fls. yellow, with a pink hood. Burma. B. M. 4435.—This is now referred to *C. petiolata*, Roxb., but B. M. 5821 seems at least horticulturally distinct, with its rose-pink bracts.

C. albiflòra, Thwaites, differs from the others here described in having its spikes sunk below the lvs., instead of standing high above the lvs., and all the bracts have fls., while the others have a sterile portion of the spike which is brightly colored. In this species the spike is short and green and the fls. are prominent and white. Ceylon. B.M. 5909.—*C. Australásica*, Hook. f., has its upper bracts soft, rosy pink and the fls. pale yellow. Australia. B. M. 5620.—*C. Roscoeàna*, Wall., has a long and splendid spike, with bracts gradually changing from green to the vividest scarlet-orange: fls. pale yellow. Burma. B. M. 4667.—*C. Zedoària*, Roxb., has the upper bracts white, tinged with carmine, and handsomely-variegated lvs., which, with the green of the lower bracts and the yellow of the flowers, makes a striking picture of exotic splendor. Himalayas. B.M. 1546.

W. M.

CURLED LEAVES are often caused by aphids or plant lice. For remedies, see *Spraying*. The leaf-curl of the peach is a fungous disease. See *Diseases*.

CURMÈRIA. All referred to *Homalomena*.

CURRANT. Four species of Currant are known to American gardeners as fruit-bearing plants. *Ribes rubrum* (Fig. 610) includes all the red and white varieties. This species is found wild both in Europe and North America. *Ribes nigrum* (Fig. 611), the European black Currant, although well known in America, has never become generally popular, although it is much prized by the foreign population. *Ribes Americanum* (Fig. 612), more commonly known as *Ribes floridum*, is the wild black Currant of America. It is very similar in character to the European black Currant, and is now and then transferred to gardens. *Ribes aureum* (Fig. 613), oftener grown for ornament, has also been planted for fruit, having been sold from time to time under various varietal names, the most recent being the Crandall. See *Ribes*. To the commercial fruit-grower only the first of these species is of great importance. It is a native of cool climates, and its profitable culture is confined to northern latitudes. It does not thrive in the Gulf states and, except under irrigation or in specially favorable locations, makes but a partial success in the drier region of the Plains.

Both experience and the natural habitat of the plant indicate that a cool, moist soil is best adapted to its growth. Strong, moist loams, with a considerable admixture of clay, are preferable. Even a stiff clay, well drained and in good tilth, will give good results. In small supply for the home garden, it may be grown in almost any soil. A cool northern exposure or partial shade is always desirable, and the more unfavorable the soil, or the more nearly does the location approach the southern range of adaptation, the more important does this become. For this reason western growers often find the best results to come from planting in orchards, and

611. Black Currant—Ribes nigrum.

the home grower may attain the same end by utilizing the north side of buildings or fences. Elevation may aid in offsetting the unfavorable influence of lower latitude. It is an extremely hardy fruit so far as cold is concerned, but cannot endure continuous high temperature.

The Currant needs a rich soil and an abundance of plant-food. It will endure much neglect, but responds quickly to liberal treatment. Stable manure, applied in the fall, is excellent, and this may be supplemented with applications of potash, which will improve the quality of the fruit.

Propagation is best effected by means of long hardwood cuttings (Fig. 614), taken either in fall or spring. In nursery practice they are commonly taken about September 1, as soon as the leaves fall. The leaves are sometimes stripped from the plants a week or so before taking the cuttings, if they have not already fallen. The cuttings may be planted at once, or tied in bundles and buried upside down, with 2 or 3 inches of soil over the butts. This is thought to favor the production of the callus and to aid the formation of roots. At the approach of cold weather, they may be taken up and planted in nursery rows and covered with a mulch of soil or other material during the winter, this mulch being raked away to expose the tips early in spring. Planting may be delayed until spring, the bundles being taken up and stored in sand or moss in the cellar, or being more deeply covered and allowed to remain where they are. The commoner practice is to plant the cuttings in nursery rows soon after they are taken. They are said to root more quickly if packed in damp moss a week or two before planting. Mulching of some sort is essential during the winter. Probably nothing surpasses the soil itself for this purpose, certainly not in the drier climate of the Plains. If the cuttings are kept until spring, planting must be done very early, as growth begins at a low temperature. This makes spring planting undesirable in nursery practice. Cuttings vary in length from 6 to 10 inches, according to soil and climate; the drier the climate and the lighter the soil the longer should the cutting be. In planting, only 1 or 2 buds are left above the surface, and the soil should be pressed firmly about the base. Rich, moist soil should be selected. A former practice was to cut out all lower buds in order to insure a tree form of growth. This is seldom practiced now, and never for commercial planting. Single-eye cuttings under glass, greenwood cuttings and layers may be employed, but have little to recommend them. Seeds may be used as a source of new varieties, and are best sown or stratified as soon as taken from the pulp.

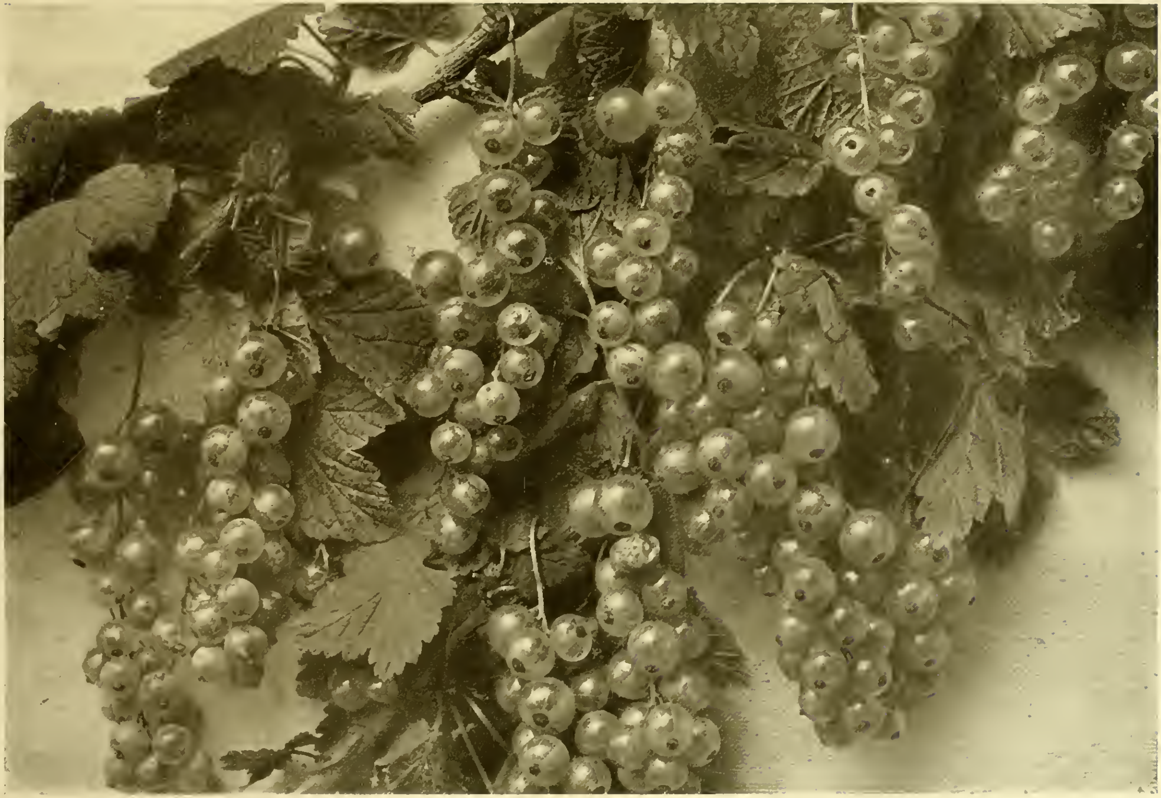
612. Native Black Currant—Ribes Americanum (× ⅓). The fruit is immature.

613. Buffalo Currant (× ½).

For the final planting either 1- or 2-year-old plants may be used, set at distances varying to suit the convenience of the cultivator. Four by 6 feet is a convenient combination, allowing cross cultivation at intervals. The land should be in fine, mellow tilth as deep as plowed, and if the underlying layers are hard and impervious, it should be subsoiled. Setting is most conveniently done by marking the land in each direction, plowing furrows one way and planting at intersections. The soil should be closely firmed about the roots, with a loose layer left at the surface to act as a mulch. Where fall planting succeeds it is desirable, since the Currant starts so early into growth in the spring. In many parts of the country fall planting is too uncertain, while spring planting, if done early enough, is always safe.

Subsequent tillage should be frequent but shallow, as the roots run near the surface and are easily injured by deep cultivation. Good results are obtained by mulching, which is sometimes more convenient in garden culture. Refuse material of any sort may be used; even coal ashes, especially on heavy soil, give good results. Mulching is seldom, if ever, desirable in commercial work.

Pruning is simple, but important. Fruit is borne on both old and young wood, but the best of it is near the base of 1-year-old shoots and on short 1-year-old spurs. The younger the wood the finer the fruit, but a fair supply of old wood must be left to insure productiveness. From 4 to 8 main stems are desirable, and these should be frequently renewed. No wood over three years old should be allowed to remain. Superfluous young shoots should be cut away, though the buds at their base may be left to develop fruit-bearing spurs. Shortening-in vigorous, straggling shoots may be called for, especially with young plants, but the most important thing is a judicious thinning out of the old wood, and



The Fay Currant, one of the leading red varieties

replacing it with young (Fig. 615). The older plan of training to a tree form (Fig. 616) gave less productive plants, more subject to damage from the Currant borer, with no opportunity for renewal. Experiments in thinning the fruit by clipping off the outer end of the clusters have shown an increase in size and in yield.

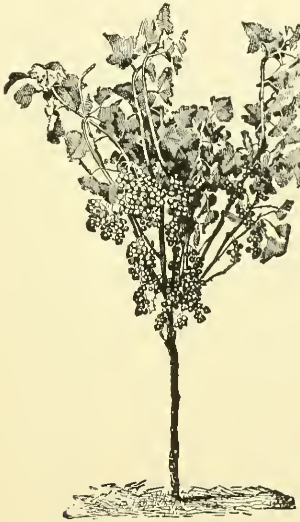
The fruit should be picked when dry, taking especial care to prevent crushing the berries or tearing them from the stems. If properly picked it stands shipment well, but if carelessly picked it will quickly spoil. For shipping purposes it must be picked while still hard and firm, though for home use or near market it will be better if allowed to remain longer, especially for dessert use. If protected with netting, it will remain on the bushes until autumn. The fruit is commonly marketed in quart baskets, shipped in crates, like any other berries, though the 9-pound grape basket is now largely used. This is a convenient package, both for the shipper and the consumer.

Plantations may be kept in bearing for many years with good care, liberal feeding and continuous renewing of the wood, but practical growers generally find it advisable to replant after eight or ten years of fruiting. The cost of replanting is light, and is more than repaid by the advantage of young, vigorous plants in fresh soil. Yields vary greatly. Many growers doubtless do not average 50 bushels per acre, while others may secure as high as 250 bushels. With good care Currants should yield from 100 to 150 bushels per acre, though even this amount will be obtained only by good culture and careful attention to details. In garden culture 2 to 4 pounds per bush may be expected, though many neglected plants scarcely yield as many ounces. Under favorable conditions they are usually a profitable crop, though, like all other fruits, they are subject to fluctuations in price and market demands.

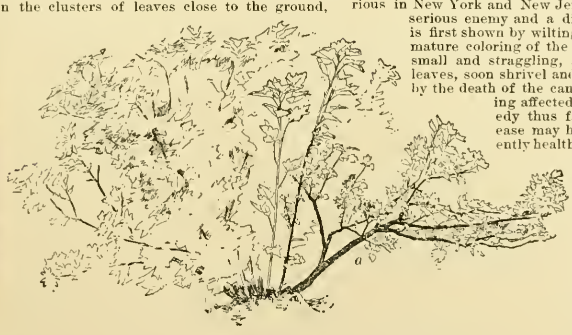
614. Currant cutting.

Red varieties are most profitable. Some of the white sorts are sweeter, but find little demand in market. Victoria is one of the most popular all-round varieties. Cherry and Versailles are probably more largely grown than any others. Fay is capricious, succeeding remarkably well in some locations, but proving unsatisfactory in others; its habit of growth is straggling and undesirable. Red Dutch, though small, is still highly prized on the Plains; Prince Albert, a very productive late variety, is popular with canners and for jelly. Among newer varieties the Wilder is promising. White Grape and the newer White Imperial are popular white varieties. Black Currants are little grown in the United States but are popular in Canada. Black Naples (Fig. 611) is the most popular kind.

The best-known insect enemy is the imported Currant worm (*Pteronus Ribesii*), which never fails to strip the leaves from neglected bushes throughout the eastern United States, though as yet unknown on the Plains. It begins feeding on the clusters of leaves close to the ground, and if taken in time may be poisoned with arsenites, though powdered hellebore, at the rate of a teaspoonful to a gallon of water, is the common remedy, and the one which should be used after the fruit sets and the insects have scattered over the bushes. The imported and native Currant borers also cause damage. They can only be controlled by cutting out and destroying infested canes early in spring, before the perfect insects emerge. The Currant fly (*Epochra Canadensis*) sometimes causes serious injury to the fruit, depositing its egg just beneath the skin, where the presence of the larva causes the fruit to turn red and fall prematurely. No practicable remedy has yet been suggested. Among fungous diseases, there are several which prey upon the leaves, causing them to fall prematurely, but they all yield to thorough treatment with fungicides. The Currant tubercle, a disease which has recently proved injurious in New York and New Jersey, threatens to be a serious enemy and a difficult one to fight. It is first shown by wilting of the leaves and premature coloring of the fruit. The clusters are small and straggling, and, together with the leaves, soon shrivel and fall, which is followed by the death of the canes. Digging and burning affected plants is the only remedy thus far suggested. The disease may be transmitted in apparently healthy cuttings, so that fields known to be affected should not be used as a source from which to propagate.



616. Tree-form training of Currant.



615. To illustrate the pruning of a Currant bush.
The old cane, *a*, is to be cut away. The straight new canes at left are to remain.

The treatment of black Currants does not differ materially from that of reds, except that the plants, being larger, require somewhat more room. The fruit, though possessing a most unpleasant odor and flavor, becomes agreeable if scalded for a few minutes in boiling water, and then transferred to fresh water for cooking. It is much esteemed by those who have learned to use it, and is credited with medicinal qualities of value in bowel and throat affections. The plants are exempt from attacks of the Currant worm.

FRED W. CARD.

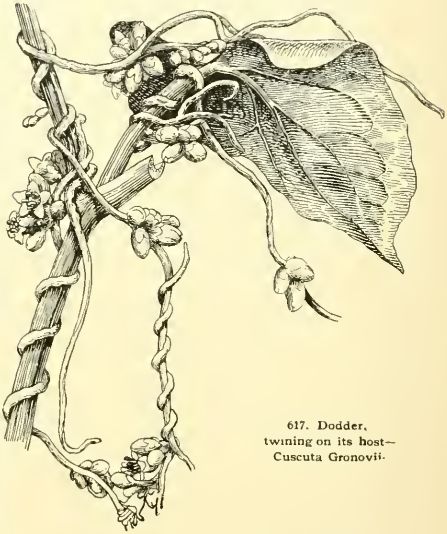
CÚSCUTA (origin of name obscure). *Convolvulàceæ.* DODDER. A genus of degenerate parasitic twiners, bearing clusters of small fls. They are leafless annuals, with very slender yellow or red stems, which become attached to the host-plant by means of root-like suckers. The seeds fall to the ground and germinate in the spring. As soon as the young shoot finds an acceptable host, the root dies and the plant becomes parasitic. Failing to find a host, the plant dies. Dodders are common in low, weedy places. Some species are also serious pests, as the Clover Dodder and Flax Dodder. One of the common species (*C. Gronovii*, Willd.), of low grounds, is shown in Fig. 617.

CUSHAW. One of the many names of *Cucurbita moschata.*

CUSTARD APPLE. Species of *Anona.*

CUT-FLOWER INDUSTRY IN THE UNITED STATES. Fifty years ago it would not have been possible to purchase Cut-flowers during the winter season in any of the large cities of this country. Today there is scarcely a village of 2,000 to 3,000 population that does not boast of its florist, whose revenues are largely augmented by the sale of Cut-flowers. Millions of dollars are invested in the cultivation and sale of Cut-flowers in the neighborhood of the large cities of the United States. The growth and evolution of the business has been very rapid in the past 25 years. From 1860 to 1875 the camellia was the most valued of all Cut-flowers, either for personal adornment or bouquets, as much as $1, $2 and even $3 having been obtained for a single flower at the holiday season. At the present time they are almost forgotten, and are only to be found in private collections and in the south, where the plants will live out during the winter season. The principal flowers forced at that time, in addition to the camellia, were daphne, bouvardia, abutilon, nasturtium, callas, sweet alyssum, poinsettia, carnations and a few LaMarque, Bon Silene and Safrano roses. The taste was for set designs. All flowers were picked with short stems, or none at all, only the open portions of cluster flowers being taken, and the buds left to open. These small pieces were bound with wire to wooden sticks for basket work or to broom corn straws for making into bouquets. The popular table design was called a pyramid. It consisted of a number of bouquets each with one camellia in the center and a single row of smaller flowers around, backed up with lycopodium green. The smaller bouquets were then arranged in a wire frame, the sticks on which they were made serving to hold them in the desired position. The top of the pyramid was a bouquet with a calla lily in the center. These table pieces frequently cost from $35 to $75, and sometimes $100 was asked for a particularly fine design. The small bouquets were distributed to the guests at the close of the entertainment.

Only small quantities of roses were forced for winter cutting at this time, a few florists in Boston and New York being engaged in their cultivation in the same houses with other flowers. Competition and a demand for better buds, together with the good prices obtained for the best, caused growers to give the "queen of flowers" more attention, and the result was that the rose steadily grew in favor and people began to wonder what they saw in the camellia to admire. A demand for larger roses than the small Teas resulted in a trial of some of the Hybrid Remontants. General Jacqueminot was found to force well and soon became a great favorite, bringing from $1 to $2 a bud for the first cutting. The beautiful yellow Marechal Niel was also forced. The flowers sold well, but it was scarcely prolific enough to be profitable, and the advent of the yellow Tea Perle des Jardins, an Everbloomer, very prolific and of easy cultivation, soon drove it from the market. The next rose sensation, and the most important addition that has been made to American forcing roses even to the present day, was the introduction of the Catherine Mermet. This beautiful variety, which sprang into great popularity at once with the flower-buying public, was found very profitable by the growers, who, by careful cultivation and the incentive of the high prices realized for choice flowers, soon elevated the standard of cut roses to a higher level, and attracted new capital to what had now become a thriving and lucrative business. While so famous in itself, Catherine Mermet will, however, probably be longer remembered as the parent of those truly grand Teas now so universally grown, the Bride and Bridesmaid, the standard pink and white roses of to-day. Many varieties for which special claims were made have been introduced from time to time, but, for the most part, they have proved vexatious and expensive experiments. Next to the Catherine Mermet in importance is the American Beauty (Mme. Ferdinand Jamin), the finest of all the forcing roses. The introduction of this variety by the Fields Brothers, of Washington, produced a great stir in rose circles. Fine as it appeared at first, however, its after development surprised even the most sanguine, and to-day it stands unrivaled as the most profitable and at the same time the most popular with the wealthy classes of flower-buyers.



617. Dodder, twining on its host—Cuscuta Gronovii.

While the development of the rose was taking place, the carnation, ever popular, was receiving the attention of the breeder, and new varieties showing great improvement in form, color and productiveness were introduced annually. It was soon found that roses and carnations did not give best results when grown together in the same house. They required different treatment. Roses thrive better in a warmer atmosphere than carnations. Different forms of greenhouse structures were also found necessary. The original means of heating was by brick furnaces and flues. Hot water and steam generated in iron boilers and distributed through pipes, although more expensive to install, were found much more efficient, and withal the most economical plan.

In the early growth of the business the grower was also the retailer. The rapidly increasing demand, however, ushered in the middle man or retail florist, who relieved the grower of his stock as soon as it was ready for the market, and enabled him to devote his entire attention to cultivation. From this period, the business began its most rapid development, as the more convenient location of the flower stores in the populous centers induced a better patronage and consequent love for flowers, and enabled the grower, by reason of his undivided attention, to produce more perfect stock and increase the productiveness of his plant.

It was soon found that by giving attention to but one kind of flower, better results were obtained, and many rose, violet, and carnation specialists were developed. The success of one grower often induced his neighbors to follow his example. Two or three successful men in a locality gave rumor to the place being, by reason of its soil, climate, etc., particularly adapted for the production of a certain flower, and a colony of such growers would soon spring up. Note the violet growers of the Hudson, in New York ; the rosarians of Madison, N. J., and the carnation belt of Chester county, Pa. As the business has developed and grown all over the United States, it has been found that it is not so much in the locality as in the methods of culture that success is attained. With the great expansion of the industry, the handling of the large quantities of flowers thrown on the market became a difficult problem. The Thirty-fourth St. cut-flower market, in New York, originated from the retail dealers meeting the Long Island growers every morning at the ferry. A convenient restaurant opened its doors during inclement weather, where for years a large business was carried on. An association of growers was finally formed, which established, in an adjoining commodious building, a market, which has since been very successful and a great convenience to both branches of the trade.

The wholesale handling of flowers on commission was commenced in New York city in 1878, by J. K. Allen. This plan soon became popular, numerous houses were established, and the stock coming to the New York market, particularly that of the large growers, is mainly disposed of through these channels. The excellence of the flowers supplied and the better market of the large cities caused a considerable shipping demand, which provided a much-needed outlet for the immense quantities of stock that at times were greatly in excess of the local needs. With the present complete shipping facilities, together with the improved methods of packing, Cut-flowers are now shipped long distances, arriving at their destination in a satisfactory condition after journeys of from 36 to 48 hours' duration.

The final distribution of the flowers through the avenues of the retail florist engages a considerable number of men in all the large cities of the country. Many of the establishments compare favorably with the finest stores of other lines, while the delivery service, with its fancy wagons and liveried attendants, is especially notable. Great attention is paid to the decorative features of these high-class establishments. Their show windows contain at all times samples of the finest plants or flowers in season, or examples of their artistic arrangement. The evolution of the business during the past twenty years has been gradual, but has moved steadily onward. Wire and sticks have almost entirely, or as much as possible, been displaced by the improved and natural stems of the flowers themselves. The arranged basket of flowers, once so popular as a gift, has now given way to the box of long-stemmed roses or cluster arrangement of the same, to which are added orchids, violets, or other choice flowers, as preferred. The custom of sending flowers to young lady debutantes, which has become fashionable the past few years, has become an important feature of the trade, and atones in a measure for the discontinuance of the ball bouquet, once so popular but now almost obsolete.

Christmas and New Year holidays were at one time equal factors in taxing the florists to the utmost to supply the demand for their goods, but of late years the 1st day of January has lost this floral feature, and is no longer considered of importance. The Easter holiday trade has grown, however, from scarcely any business in the early days, to be the most important event of the year ; in fact, with many growers it is the greatest harvest, as almost all their winter season is given to preparing plants and flowers for the Easter demand. Since the introduction of the *Lilium Harrisii*, or Bermuda-grown *Lilium longiflorum*, hundreds of thousands of these bulbs are forced for this festival. Azaleas are probably next in demand, large quantities being annually imported for forcing. It would be difficult to estimate with any accuracy the amount of business transacted by the florists of this country for the Easter festival, but the sum total must be enormous.

The old-time florist was satisfied with one crop from his greenhouses—that of bedding plants for spring planting. During the summer the houses stood empty, and for a large part of the winter contained dormant or semi-dormant stock. The wide-awake grower of to-day never allows any portion of his plant to remain idle even for a week, one crop being arranged to follow another in close rotation.

As flowers are very perishable articles, and depend for their existence on certain conditions of light and heat, there are times when the supply is not sufficient for the demand; and again when the quantity coming into the market is more than can be disposed of at the current rates. Of late years over-production has been the bugbear of the business. Half of the season the market has been over-stocked. Consignment follows consignment, until the commission houses are at their wits' ends to dispose of them. Here an important factor was introduced. The fakir, or street man, became a customer for job lots at low prices. Through him immense quantities of flowers, for which no other avenue was open, have been sold daily in all the large cities. Their plate glass cases in doorways or by blank walls are to be seen throughout the shopping districts filled, as a rule, with good flowers, with few exceptions.

The principal and most popular Cut-flowers grown in this country are distinctively American. The Bride and Bridesmaid roses are American sports of the Catherine Mermet. The American Beauty, as it is grown here, is vastly different from Mme. Ferdinand Jamin of Europe. The Kaiserin Augusta Victoria and Meteor are European sorts. The carnations grown are of an entirely different type from the European varieties, and are all American seedlings. The evolution that is taking place in this flower is wonderful, as the standard is being so constantly raised that varieties that were considered superior ten years ago are now scarcely known. The American Carnation Society, composed largely of commercial carnation specialists, has done much to advance the quality and general excellence of this superb flower. Chrysanthemums that produce best results here are nearly all of American origin, from plants imported from Japan. New varieties are introduced each year, some of which show improvement and spur hybridizers on to renewed efforts.

The demand for palms and decorative foliage plants has kept pace with that of flowers, if, indeed, it has not taken the lead. The increase in the greenhouse space given up to the growth of palms is at least threefold within the past ten years, and it may be said that the demand exceeds the supply, although the stock is augmented largely each year by importations from Europe. Whole houses are given up to the production of *Ficus elastica*, which plant is a great favorite with the masses. Great quantities of ferns for table decorations are now used, the little fernery being considered as indispensable as the china to the setting.

The public taste at the present day is mostly for loose arrangements of long-stemmed flowers. Stiff, formal designs are tabooed. The popular funeral emblem is forms of the wreath, which is made with a great variety of flowers, often all of one kind. Loose clusters tied with ribbons, and palm leaves (sago palms) crossed and tied with ribbons and flowers, are also favorites. House decorations are largely composed of long-stemmed roses, carnations, etc., placed in vases, but few, if any, set pieces being allowed. Table decorations for dinners are also confined to the use of long-stemmed flowers in vases, and others arranged on the cloth with ferns. Churches are trimmed with palms, plants in flower and long-stemmed flowers in tall vases, all being done, as in other instances, to show, as far as possible, the natural grace of the flower. Bridal bouquets are also arranged loosely, some with shower effect, by means of flowers tied to narrow ribbons ; others tied with broad ribbons, to be carried in the hand or over the arm. The flowers mostly used are roses and lilies-of-the-valley. Tastes differ but little in the various cities, there being a similarity in all the first-class work. There is no essentially eastern or western flower. With the possible exception of some varieties of carnations, the assortment of flowers will be found the same the country over. In the census of 1890 Cut-flowers were estimated to make more than one-half of the florist's business. One good book especially devoted to the business has been produced,—the late M. A. Hunt's "How to Grow Cut-flowers.' Robert Kift.

CUTICLE. The outer surface of herbaceous parts of plants. It consists of the outer walls of the epidermal cells. These walls are much thickened and cutinized. Minute waxy rods upon the cuticularized surface of many fruits, such as the grape and plum, give to them their peculiar bloom. The Cuticle is nearly impervious to water. The preservation of fruits depends in large measure upon the retention of moisture by the Cuticle. Cacti and other desert plants have their epidermis remarkably cuticularized. W. W. Rowlee.

CUTTAGE. The operation and practice of growing plants from severed parts. A cutting is the gardener's name for a piece of the stem, root, rootstock or leaf, which, if cut off and planted under suitable conditions, will form new roots and buds, reproducing the parent plant. This term is usually given to parts of the stem; a part or the whole of the leaf, when so used, is called a leaf-cutting; a piece of root or rootstock is called a root-cutting. The scales of some bulbous plants, e. g., the lily, can also be used as cuttings. A cion used in grafting might be called a cutting which unites and grows on the roots of another plant. See *Graftage.* Plants obtained by division or layering are provided with roots before they are detached from the parent plants, and, therefore, are not properly cuttings.

Multiplication by cuttings is a form of bud-propagation in contradistinction to sexual reproduction, i. e., propagation by seeds. It is a cheap and convenient way to obtain plants. All plants cannot be profitably increased by these means. Why they differ we do not know; the gardener learns by experience what species yield a good percentage of healthy plants, and acts accordingly.

The following table will show the different ways in which cuttings are made:

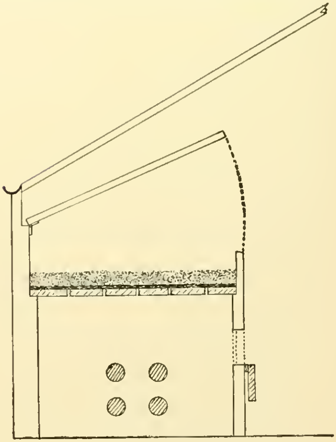
- Cuttings
  - Stem
    - Growing wood
      - Soft, e. g., Verbena
      - Hardened, e. g., Tea roses
    - Ripened wood
      - Long, in open air, e. g., Grape
      - Short, under glass, e. g., Japanese cedar
  - Roots or rootstocks
    - Short, under glass, e. g., Anemone Japonica
    - Long, in open air, e. g., Blackberry
  - Leaf
    - Entire, e. g., Echeveria
    - Divided, e. g., Begonia Rex
    - Bulb-scales, e. g., Lilies

(1) *Cuttings of Growing Wood.*—Fig. 618. These are made either of the soft growing tips, as in coleus, salvia, verbena, etc., or, of the same wood in more mature condition, but by no means ripe, as in tender roses, *Azalea Indica*, etc. The cuttings of plants like *Euphorbia pulcherrima*, erica, epacris, etc., are used in the soft growing state, if a well built propagating house is obtainable; but in an ordinary house, a part of which is used for other purposes, the older and better ripened wood will be more successful. It is generally true that cuttings of hardened wood will always root, although they require more time and may not make the best plants, but it is not true that cuttings of the soft wood will always root. In many cases, as in the rose, they succumb before they callus, much less produce roots. In plants of rapid growth and good vitality, the proper condition of the soft growing wood for cuttings can be determined by its readiness to snap, not bend, when bent back: the hardened wood is in the right state as long as it continues to grow.

618. Cutting of soft growing wood. (Coleus.)

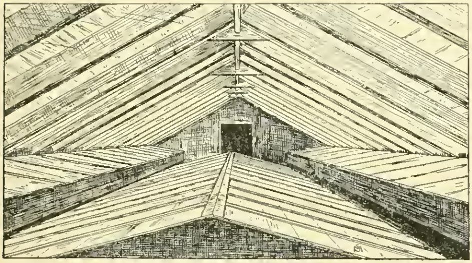
The treatment of cuttings in both classes is practically the same. They should be planted in sand under glass. Large establishments have one or more houses set apart for this and similar purposes. In smaller places a propagating bed or bench can be made at the warmest end of the warmest house. It should be placed over the pipes where they leave the boiler, and, in order to secure bottom heat when needed, the space between the bench and the floor should be boarded up, having a trap door to open on cold nights (Fig. 619). Cutting-frames inside a greenhouse are also shown in Fig. 620. Side partitions should also be provided to box in all the heat from the pipes under that part of the bench. Good dimensions for such a bed are, width 3 feet, length 6 feet or any multiple of 6, thus making it simple to use a hotbed sash when confined air is wanted. The depth of the frame should be from 6 to 10 inches in front and from 12 to 15 inches behind. The bottom of the bed may be either wood, slate or metal and should be well drained: place a layer of potsherds first, then moss, and from 2 to 3 inches of sand on top. The sand should be clean, sharp and well compacted: before planting it should be watered if at all dry. It is sometimes advisable to have the bed filled with moss (sphagnum), into which pots or boxes containing cuttings are plunged: the moss should be moist, neither too wet nor dry, and well packed.

In many cases, when large quantities of one sort of cuttings are to be planted, the ordinary greenhouse bench covered with sand is sufficient (Fig. 621). Other forms of propagating beds are shown in Figs. 622, 623, 624. See, also, Bailey's Nursery Book, 3d ed., pp. 44–53.



619. Section of propagating bed.
Shows four pipes beneath, the door on the side, and the frame cover.

The wood for cuttings should be fresh, and precautions should be taken to prevent wilting during making and planting: if the weather is hot, sprinkle the floor and bench of the work room: if they are delicate, and exposed for an hour or more, lay them between folds of moistened paper. The average length of these cuttings is from 1 to 3 inches, but they can be made longer or shorter; much depends upon the nature of the plant. The best growers prefer short cuttings; the advantage of a long piece to begin with is more than offset by greater danger of wilting and consequent retrogression. It is not necessary to cut to a bud, i. e., at the node, in the more easily handled plants except in some herbaceous tuberous-rooted plants, like dahlia (see Fig. 625), and *Salvia patens,* in which a crown must be formed to insure future growth. Make the cut where it will give the proper length. A part of the leaves should be removed, always enough to secure a clean stem for planting, and as many more as are needed to prevent disastrous wilting: this factor varies greatly. In a hardwood cutting of lemon verbena all leaves are taken off, in zonale geraniums from the open ground few if any are left, in coleus and verbena about one half are removed, while in *Olea fragrans*, *Daphne odora*, heath, etc., only enough for planting. Use a sharp knife; but scissors are handy for trimming and sometimes for making cuttings of those small wooded plants which root easily.



620. Permanent propagating frames in a greenhouse.

The cuttings of plants with milky juice should be washed before planting. Sometimes the lower ends are allowed to dry for several hours, the tops being protected against wilting. Large and succulent cuttings, e. g., of pineapple, cotyledon, cactus, etc., should be dried before planting by letting them lie on the surface of the propagating bed for several days, or they may be planted in dry sand at first. Under these conditions a callus forms which tends to prevent decay; but the wood must not shrivel.

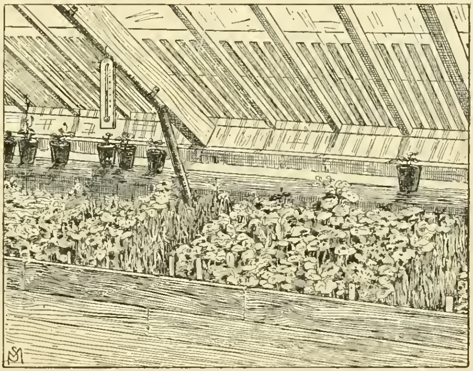
Peter Henderson has introduced a method which is likely to increase the percentage of rooted plants, and which is desirable in slow-growing varieties, like the tricolor geraniums. He advises that the cutting should be partly severed and allowed to hang to the parent plant for a few days; this results in a partial callus, or even roots, before the cutting is entirely removed.

In planting cuttings, use a dibble or open a V-shaped trench. Never thrust the cutting directly into the soil. Plant deep enough to hold the cutting upright and no deeper, making due allowance for the sand settling; the distance apart should be just enough to prevent them from pressing against each other. It must be remembered that they stay in the bed only until rooted. As soon as growth begins, they are potted off. When the cuttings are inserted, the sand should be firmly pressed about them, and they should be watered with a syringe or with a fine rose; the forcible application of water compacts the sand, thus excluding air, and prevents undue wilting.

Give shade immediately, using lath shutters outside, or paper or cloth screens within, and attend to this very carefully for the first few days. Lift the shades early in the afternoon, and put them on late in the morning, but keep them on during the middle of the day, thus gradually accustoming them to full light.

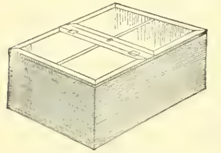
Cuttings should never suffer from dryness. The sand should always be kept moist to the verge of wetness. Ventilation should be given on bright days, but all exposure to draft avoided. A good temperature for propagating is from 60° to 65° F., increasing these figures for tropical plants and reducing them for more hardy kinds. It is debatable whether bottom heat and confined air are advisable for cuttings of growing wood. The older gardeners employed both, but now neither is commonly used, except for tropical plants, like croton, or when a constant succession of crops of cuttings is required. There is no doubt that with this aid cuttings will root more quickly, but more skill and care are required, neglect bringing on fungous disease, which results in unhealthy plants or total loss. If bottom heat is used, the average temperature of the bed should be 10° or so above that of the air, but less will suffice. Indeed, in beds made as described above, in good weather the sand is enough warmer than the greenhouse atmosphere to answer every purpose. If a confined air is used, ventilation and shading must be carefully looked after, and precautions taken against the accumulation of condensed moisture within the bell-glass or frame.

Sand is the medium commonly employed for the rooting of cuttings, selecting the coarser kinds for plants like geraniums and finer for heaths. Brick dust and powdered charcoal are sometimes recommended, and "Jadoo fiber" is now on trial. Sphagnum is useful in rooting *Ficus elastica*, the base of the cutting being wrapped in a ball of moss and plunged in a bed of moss. English ivy, oleander and other plants can be struck in water, but this method is cumbersome. Peter Henderson's saucer method is valuable in hot weather: the cuttings are planted in sand, kept saturated and fully exposed to the sun. Large cuttings can be planted singly in 2- or 3-inch pots, the pots then being plunged in the cutting bed. In such cases some well rotted leaf-mold, less than one-half, can be added to the sand.

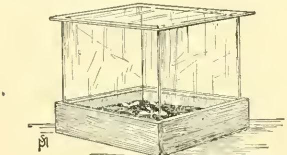


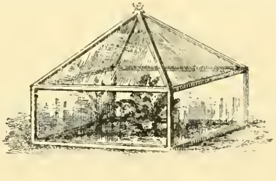
621. Cutting bench shaded with lath.

Although it is tender plants, in the main, which are propagated by cuttings of growing wood, the above methods can be practiced advantageously with some hardy plants. The wood, which is invariably more successful if hardened, is obtained either from plants forced for this purpose, e. g., spirea, *Deutzia gracilis*, etc., or it is gathered in June and July out of doors, e. g., lilac, hydrangea, etc. Cuttings of growing wood should be potted in 2- or 3-inch pots, in a rather sandy soil, when the roots are from ¼-½ inches long. It is sometimes good economy to box them, i. e., plant them a few inches apart in flats, when not immediately required.


622. Propagating-box.

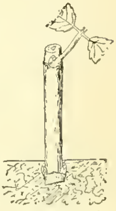
(2) *Long Cuttings of Ripened Wood in Open Air.*—This method is used to propagate many hardy trees and shrubs, e. g., willows, currants, grapes, forsythia, etc. Wood of the current year's growth is gathered in autumn or early winter, before severe frost, and either stored in a cool cellar, covering with moss or fresh earth to prevent drying, or immediately made into cuttings. These (see Fig. 626) should be made 6 inches or more long and should contain at least 2 buds. It is not necessary to cut to a bud at the base, but the upper cut should be just above one. They should be tied in bundles with tarred rope, taking care to have them lie "heads and tails" to facilitate planting, and with the butts on the same level, to promote callusing. They should then be buried in sandy soil, with the butts down and protected against frost. In early spring they should be firmly planted in V-shaped trenches in well prepared soil: set an inch or so apart, with the rows 1 or 1½ feet apart. The upper bud should be just at the surface; to prevent suckers the lower buds may be removed. In autumn they should be dug, graded and heeled-in for winter. Some varieties will require a second or third year's growth in the nursery; others are ready for permanent planting, as willows and poplars, which often grow 6 feet the first year. This is one of the very cheapest ways of propagating, and will pay where only 25 per cent root. This method is generally used with deciduous-leaved plants, but some conifers, e. g., Siberian arborvitæ, will strike. Remove enough twigs to get a clean stem for planting, and allow 2 or 3 inches of top above ground.

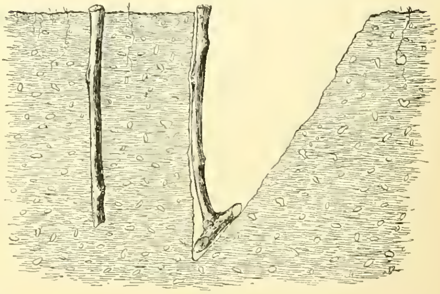

623. Small propagating-box, adapted to a window.


624. Propagating-box or hood.

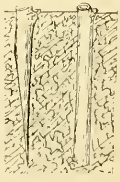
The excrescences, knots or knaurs, which are found on the trunks and the main limbs of olive trees, are sometimes used as cuttings for propagation.

(3) *Short cuttings of ripened wood* (Fig. 627) are used under glass with tender or half-hardy species, with new introductions, in cases where the grower is short of stock, and when the plant is delicate and small. The wood should be gathered before severe frost and the cuttings made and planted directly in October and November. Make them from 2–4 inches long (sometimes a single eye only is used), and plant with a dibble, in pure sand in pots, pans or flats (boxes about 16 inches square and 3 inches deep). If a layer of potting soil is placed under the sand, the young plants have something to feed upon and do not need to be potted so soon after rooting; if this is done, drainage should be given. It is important to keep them cool until a callus is formed or roots produced. If the buds start into growth before this, the cuttings become exhausted and are likely to die. After rooting,—the time required varies from one to six months—they can either be potted or the strong-growing sorts be planted out in well prepared beds in May or June, where they are likely to make a satisfactory growth. The weaker kinds can remain a year in pots or flats, be wintered in a pit, and planted out the next spring. Some greenhouse plants, e. g., *Camellia Laurestinus*, tender grapes, etc., are propagated in this way with cuttings of fully ripened wood, and others, as cactus, dracæna, etc., with wood which is much older. They should be given the care described under the head of (1) Cuttings of Growing Wood, but they must not be forced too hard at first. The temperature should be regulated by the nature of the plant. The safest rule to follow is to give a few degrees more heat for propagating than the plant received when the cutting was removed.


625. Hardened-wood cutting of dahlia.


626. Long cuttings of ripened wood.

(4) *Root-cuttings* (Fig. 628) are made of either root or rootstock and are useful in propagating some plants, either in the greenhouse or in the open air. Tender plants, like bouvardia, and those which are hardy but of delicate growth, e. g., *Anemone Japonica*, are handled under glass; blackberries, horseradish, etc., out of doors. The cuttings are made in autumn or winter, the roots of hardy plants being gathered before severe frost and either planted directly or kept in moss until spring. This process of storing develops a callus and has a tendency to produce buds. For greenhouse work, the cuttings are made


627. Short cuttings of ripened wood.

from 1–2 inches long, the larger roots being selected, although the small ones will grow. They are planted in pans or flats, in soil composed of equal parts sand and well rotted leaf-mold. Ordinarily they are set horizontally. If planted vertically, in cuttings from the true root the end which was nearest the crown should be uppermost; but if made from the rootstock, that end should be uppermost which grew farthest from the crown. In either case they should be covered, as seeds are covered, and the whole made firm. Root-cuttings of hardy plants should be kept cool at first and brought into heat only when ready to grow. They may be kept in a pit or cool cellar. Tender plants require the same or a little higher temperature than that in which they thrive.

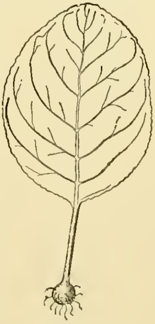
628. Root-cutting of blackberry (× ⅓).

In sweet potato, the tuber is cut lengthwise and laid, with the cut side down, on moist sand or moss, the edges being slightly covered. Buds develop on these edges and are removed when of proper size and treated as cuttings of growing wood, or allowed to remain until rooted. In dracæna (see Fig. 546, page 370)—and this applies to stem- as well as root-cuttings—the buds are not taken off until rooted; the original cutting remains in the sand and sometimes produces a second or even a third crop. The tuberous rootstock of *Arum maculatum*, and plants of like nature, can be cut into pieces, remembering that the bud-producing portion of arum is the top, and each part will grow successfully. Exercise care in watering and maintain a good temperature.

Root-cuttings for planting in the open ground are made from 4 to 6 inches long, and are planted firmly in V-shaped trenches or furrows in spring, being covered 2 inches or more deep. Roots as large as one's little finger are chosen, and good results are obtained with plants of vigorous growth. In plants like lily-of-the-valley, common lilac, calycanthus, Scotch and moss roses, etc., unless short of stock, it is better to encourage the natural growth of the suckers and propagate by division, but these can be multiplied as above described.

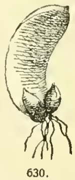
Variegation, curiously enough, is not always reproduced by means of root-cuttings.

(5) *Leaf-cuttings.*—Many leaves are capable of producing roots. Some have the further power of developing buds after rooting, and of these last a few furnish an economical means of bud-propagation, particularly where the stem growth is insufficient. In cotyledon (echeveria) the whole leaf is used, the smaller ones from the flower-stalk being often the best. Choose those which are fully matured, and, if large and succulent, expose them for a few days on the surface of dry sand, but do not let them shrivel. The treatment, othewise, is as given above for cuttings of growing wood. In gloxinia and other Gesneraceæ, the whole leaf (Fig. 629), half a leaf, or even a lesser portion, is used. When enough clear petiole is obtainable, no further preparation is needed. When a part only of the leaf is planted, some of the blade must be cut away. As a rule, no bud is developed the first season: a tuber is formed, which will grow in due time.


629. Leaf-cutting of gloxinia.

Begonia Rex is increased by leaves in various ways. The whole leaf may be planted as a cutting, keeping the petiole entire or cutting it off where it unites with the blade; or the whole leaf can be pinned or weighted to the surface of moist sand (Fig. 203, page 142), and, if the principal veins are severed at intervals of an inch, a plantlet will appear at every cut. The best way is to divide the leaf into somewhat triangular pieces (see Fig. 204, page 142), each part having a strong vein near the center. Plant in sand, in good temperature, and treat precisely as if they were cuttings of growing wood. Roots and buds will soon grow, and a good plant will result within a reasonable time. Pot off when roots are ¼ in. long.

The thickened scales of bulbs, like lilies, can be used for propagation. Remove the scales intact and plant upright, like seeds, in soil made of equal parts of sand and rotted leaf-mold (Fig. 630): September and October are the usual months for this work. If they are kept in a cool greenhouse, the young bulblets will appear in the course of the winter, but top growth will come later, in summer. This is a slow, laborious process, and is seldom practiced except in propagating new varieties. The granular scales of achimenes and plants of like nature can be used for propagating, sowing them in a sandy soil as seeds are sown; but this method is not a good one in ordinary cases. The scales of *Zamia horrida* have been made to produce new plants, and also the tunicated scales of an amaryllis. See Transactions of Horticultural Society [London], 6, p. 501.


630. Lily scale producing bulblets.

True variegation, that which comes from lack of chlorophyll matter, is not always reproduced by leaf-cuttings. The characteristic coloring in the foliage of *Begonia Rex* is never lacking in plants obtained by these means.

For further details of Cuttage, consult Lindley's Theory and Practice of Horticulture, 2d ed.; Burbidge, The Propagation and Improvement of Cultivated Plants; Peter Henderson's Practical Floriculture; Bailey's Nursery Book, 3d ed.

B. M. Watson.

CYANOPHÝLLUM. Consult *Miconia*.

CYÀTHEA (Greek, *a cup*, alluding to the indusia). *Cyatheàceæ*. A large genus of tree ferns found in both bemispheres, with a globose indusium which ultimately ruptures at the apex and becomes cup-shaped. All the species in cultivation have decompound lvs. Many other species from Columbia and the West Indies besides those described below are well worthy of cultivation.

L. M. Underwood.

This genus includes some of the most beautiful of all tree ferns. The species offer a great variety in size of trunks. Those of temperate regions are mostly stout and not spiny; the tropical species are more slender and in many cases densely armed with stout spines. All species are evergreen. Their culture is simple but exacting. They require an abundance of water at the roots and the trunks should be kept constantly moist. By these means only can a vigorous growth and fine heads of fronds be secured. The foliage lasts longer if it has been inured to the sun during summer. Like all other tree ferns, Cyatheas need little pot-room. None of the species produces adventitious growths along the trunk or at the base and none is proliferous. The plants are, therefore, usually prop. by spores, which are produced abundantly and germinate freely, making attractive young plants in two seasons.—*Abridged from Schneider's Book of Choice Ferns.*

A. *Rachides unarmed; lvs. white beneath.*

dealbàta, Swz. Rachides with pale rusty wool when young; lvs. firm, bi-tripinnate, almost pure white beneath. N. Zealand. *C. Smithii*, Hort., is regarded by some as a horticultural variety.

AA. *Rachides unarmed; lvs. green beneath.*

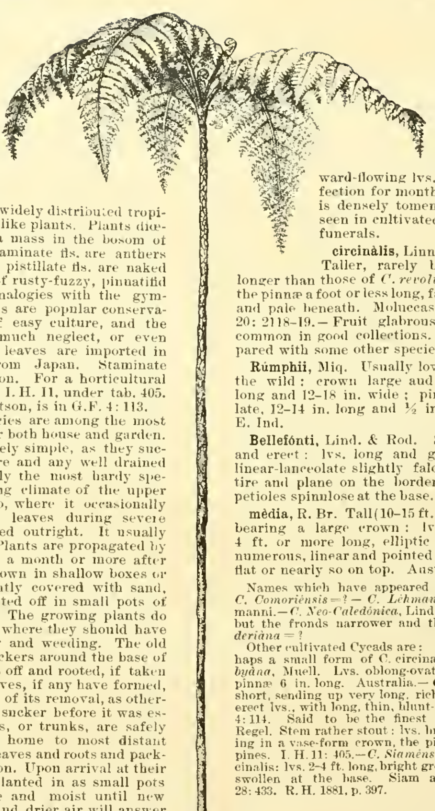
Búrkei, Hook. Stalks with tubercles near the base bearing large, glossy rusty scales: lvs. bipinnate, with broad pinnules. S. Africa.

meridénsis, Karst. Figs. 631, 632. Lvs. tripinnatifid, with oblong-lanceolate pinnæ and rather narrow lanceolete pinnules; segments scaly on the ribs beneath. U. S. Columbia.

AAA. *Rachides spiny; lvs. green beneath.*

medullàris, Swz. Lvs. bi-tripinnate, densely scaly when young, with soft, deciduous hair-like scales; segments coarsely serrate or pinnatifid, on spore-bearing lvs. N. Zealand.

L. M. UNDERWOOD.



631. Cyathea meridensis.

CỲCAS (classical Greek name). *Cycadàceæ.* Twenty or fewer species of widely distributed tropical or warm-temperate palm-like plants. Plants diœceous. The fls. appear in a mass in the bosom of the great crown of lvs. Staminate fls. are anthers borne beneath a scale; the pistillate fls. are naked ovules borne in the angles of rusty-fuzzy, pinnatifid lvs. They have striking analogies with the gymnosperms and ferns. Cycads are popular conservatory plants, for they are of easy culture, and the crowns of lvs. withstand much neglect, or even abuse. Cycas stems and leaves are imported in vast quantities directly from Japan. Staminate plants are rare in cultivation. For a horticultural synopsis of the genus, see I. H. 11, under tab. 405. A running sketch, by W. Watson, is in G.F. 4: 113.

Cycads in the various species are among the most popular decorative plants for both house and garden. Their culture is comparatively simple, as they succeed in varying temperature and any well drained soil. *C. revoluta* is probably the most hardy species, withstanding the trying climate of the upper coast of the Gulf of Mexico, where it occasionally loses its entire crown of leaves during severe freezes, but is seldom killed outright. It usually stands well at Savannah. Plants are propagated by seeds, which keep well for a month or more after ripening. They should be sown in shallow boxes or the greenhouse bench, lightly covered with sand, and, after germination, potted off in small pots of moderately rich, light soil. The growing plants do their best in partial shade, where they should have proper attention in watering and weeding. The old plants frequently send up suckers around the base of the trunk, which may be cut off and rooted, if taken in a dormant state. The leaves, if any have formed, should be cut off at the time of its removal, as otherwise they would dry up the sucker before it was established. The large stems, or trunks, are safely shipped from their native home to most distant countries, after cutting off leaves and roots and packing in cases in a dry condition. Upon arrival at their destination, the stems are planted in as small pots as possible and kept close and moist until new leaves form, when a cooler and drier air will answer for them. Their use as decorative specimens for the home is increasing, although many failures result from lack of moisture and sunshine. The soil which suits them best is a sandy or gravelly loam, and should never be allowed to get quite dry, but be kept in a moderately moist condition at all seasons. When dormant, they may be placed in the most shaded positions occasionally, but ought to have sunshine daily, when possible, for at least an hour. During their periodical growth, they should have a great deal of sunshine to insure a stocky and vigorous growth; otherwise the leaves will be drawn to an unnatural length, with few pinnæ, ruining their symmetrical form.

Cult. by E. N. REASONER.

revolùta, Thunb. SAGO PALM. Figs. 633, 634. Becoming 6–10 ft. high, and then branching: lvs. long and recurved at the end (2–7 ft.), the many pinnæ curved downward, narrow, sharp-pointed and stiff, dark, shining green. Japan. B. M. 2963–4. J.H. III. 29: 379. R.B. 21: 163. R. H. 1896, p. 369. A.G. 13: 141; 18: 1; 19: 436. Mn. 2: 88; 6: 134. — The commonest species in cult. Produces a handsome crest or crown of outward-flowing lvs., which remains in perfection for months and years. The fruit is densely tomentose, but is not often seen in cultivated plants. Much used at funerals.

circinàlis, Linn. (*C. Thouársii*, R. Br.). Taller, rarely branching: lvs. twice longer than those of *C. revoluta*, gracefully arching, the pinnæ a foot or less long, falcate, dark green above and pale beneath. Moluccas. B. M. 2826–7. F. S. 20: 2118–19. — Fruit glabrous at maturity. Not uncommon in good collections. Rapid grower as compared with some other species.

Rúmphii, Miq. Usually low, but said to be tall in the wild: crown large and full: the lvs. 3–6 ft. long and 12–18 in. wide; pinnæ pale, thin, lanceolate, 12–14 in. long and ½ in. wide; petiole spiny. E. Ind.

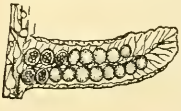
Bellefónti, Lind. & Rod. Stem short, cylindrical and erect: lvs. long and graceful, recurved, the linear-lanceolate slightly falcate, sessile pinnæ entire and plane on the border, somewhat glaucous; petioles spinulose at the base. China. I.H. 33: 586.

mèdia, R. Br. Tall (10–15 ft.), the trunk cylindrical, bearing a large crown: lvs. curved downwards, 4 ft. or more long, elliptic or lanceolate; pinnæ numerous, linear and pointed; petiole convex below, flat or nearly so on top. Australia. I.H. 26: 368.

Names which have appeared in the Amer. trade are: *C. Comoriénsis* = ? — *C. Lèhmanni* = Encephalartos Lehmanni. — *C. Neo-Caledónica*, Lind. Much like C. circinalis, but the fronds narrower and the pinnæ closer. *C. Sanderiàna* = ?

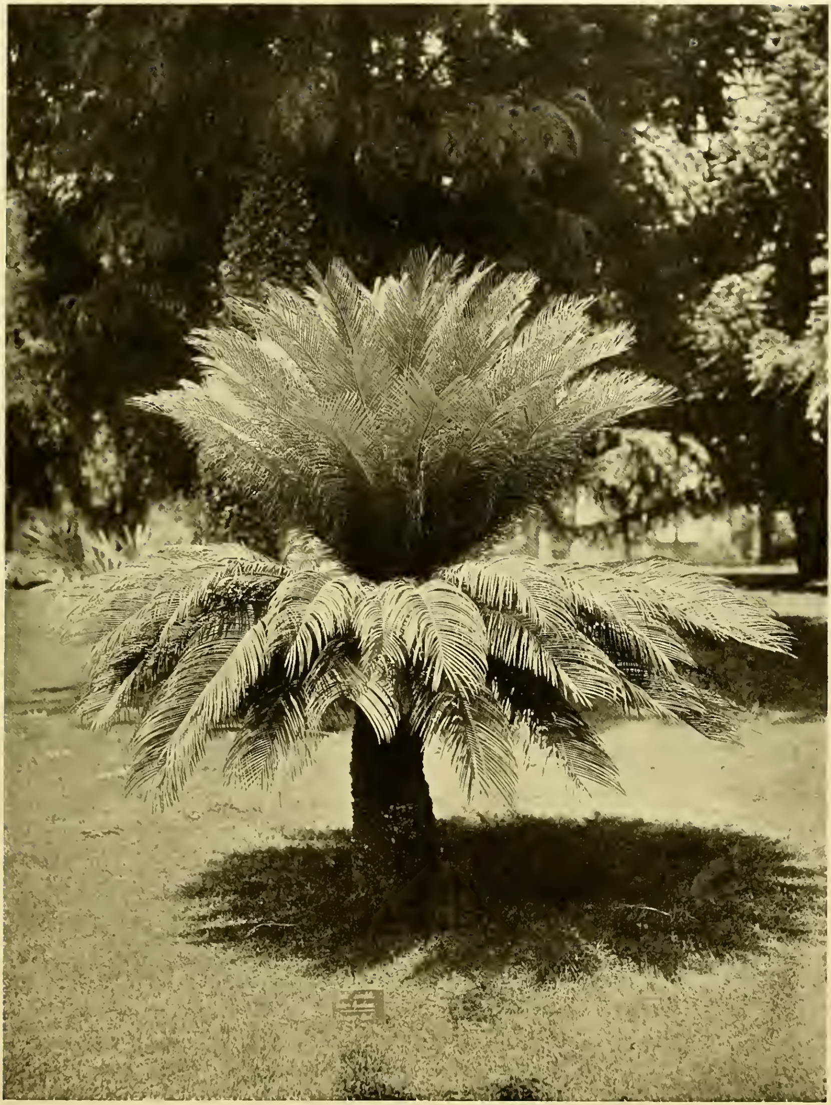
Other cultivated Cycads are: *C. Béddomei*, Dyer. Perhaps a small form of C. circinalis. E. Ind. — *C. Normanbyàna*, Muell. Lvs. oblong-ovate, with numerous linear pinnæ 6 in. long. Australia. — *C. pectinàta*, Griff. Stem short, sending up very long, rich green, plume-like, semi-erect lvs., with long, thin, blunt-tipped pinnæ. Ind. G.F. 4: 114. Said to be the finest species. — *C. Riuminiàna*, Regel. Stem rather stout: lvs. bright green, erect, spreading in a vase-form crown, the pinnæ fine-pointed. Philippines. I. H. 11: 405. — *C. Siaménsis*, Miq. Much like C. circinalis: lvs. 2–4 ft. long, bright green, graceful: trunk much swollen at the base. Siam and Cochin China. I.H. 28: 433. R. H. 1881, p. 397.

L. H. B.



632. Fruiting pinnule of Cyathea meridensis.

CỲCLAMEN (classical name, probably from the Greek word for circle, in allusion to the spirally twisted peduncles). *Primulàceæ.* A dozen or more species, mostly of the Mediterranean region and the Caucasus. Herbaceous and low, from a flattish tuber or corm: fl. single, on a scape, with usually 5-parted calyx and corolla (the parts strongly reflexed), 5 connivent stamens, with pointed, sessile anthers, 1 style and stigma, and a 5-splitting capsule. *C. latifolium* is the source of the standard florists' Cyclamens. Most of the other species are grown only as curiosities in this country; and they are essentially outdoor plants. Old English name Sowbread, from the tubers being sought by swine. Con-



Cycas revoluta growing in the open at Los Angeles

sult Fr. Hildebrand, Die Gattung Cyclamen, Jena, 1898. L. H. B.

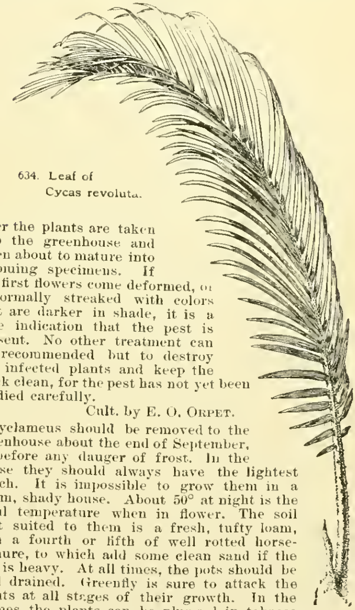
All Cyclamens are very beautiful, and would be much more popular were they hardy in our eastern climate. On the Pacific slope many of them probably would be perfectly at home as outdoor plants, producing a great number of flowers above the bare soil in the depth of winter before the leaves are developed. It is, however, with the Persian Cyclamen, which is tender, that florists have had the greatest success. There is no common winter-flowering subject of as much value for duration in bloom, variety of coloring, or wealth of color.

It is preferable at all times to begin the culture of Persian Cyclamen with seeds, sown in the early winter months. Grow on without any check for the following year. They should bloom freely about fifteen months from planting. Old tubers, such as are offered in fall with other florists' bulbs, rarely give any satisfaction as compared with a packet of seeds. It is not the nature of the plant to have all its roots dried off, as if it were a Hyacinth or Tulip. Our summers are rather too warm to suit Cyclamen perfectly, and it will be found that the most growth is made in the early autumn. It is best to give them a little shade in the hot months, such as a frame outdoors near the shade of overhanging trees at midday. This is better than growing them under painted glass, as more light is available, together with plenty of fresh air on hot days. It will be found that Cyclamen seeds require a long time in which to germinate,—often two months. This is due to the fact that the seed produces a bulb or corm before leaf growth is visible. As soon as two leaves are well developed, place the plants around the edge of 4- or 5-inch pots until every one is large enough for a 3-inch pot. The roots are produced sparingly in the initial stages, and too much pot room would be fatal at the start. By the middle of summer another shift may be given, and in September all will be ready for the pots in which they are to flower,—5- or 6-inch pots, according to the vigor of the plants. It will always be found, however, that there will be a certain percentage that will not grow, no matter how much persuasion is used. These may be thrown away to save time and labor early in the season. The Giganteum strains produce the largest blooms, but at the expense of quantity. For the average cultivator it is better to try a good strain that is not gigantic. There is a recent departure in the form of crested flowers. Cyclamens come true to color from seeds, and one can now buy named varieties that will reproduce themselves almost to a certainty.

633. Cycas revoluta.
Specimen grown in partial shade.

Of recent years cultivators have had much trouble with a tiny insect or mite that attacks the plants and renders them useless for bloom. Its work is done mostly after the plants are taken into the greenhouse and when about to mature into blooming specimens. If the first flowers come deformed, or abnormally streaked with colors that are darker in shade, it is a sure indication that the pest is present. No other treatment can be recommended but to destroy the infected plants and keep the stock clean, for the pest has not yet been studied carefully.

Cult. by E. O. Orpet.


634. Leaf of Cycas revoluta.

Cyclamens should be removed to the greenhouse about the end of September, or before any danger of frost. In the house they should always have the lightest bench. It is impossible to grow them in a warm, shady house. About 50° at night is the ideal temperature when in flower. The soil best suited to them is a fresh, tufty loam, with a fourth or fifth of well rotted horse-manure, to which add some clean sand if the soil is heavy. At all times, the pots should be well drained. Greenfly is sure to attack the plants at all stages of their growth. In the frames the plants can be plunged in tobacco stems, and in the greenhouse they must be fumigated or, what is better still, vaporized with some of the nicotine extracts. William Scott.

A. *Fall-blooming species.*

Africànum, Boiss. & Reut. The largest of Cyclamens: tubers often as large as a turnip (4–10 in. across): lvs. ovate-cordate, coarsely toothed, pale beneath, dull and pale green marbled above: calyx pubescent, the lobes broadly ovate-acuminate: corolla nearly white, faintly rose- or purple-tinged, the segments 1 in. long and deep purple at the base. Algeria. B.M. 5758. F.S. 8:841.—Little known in this country, but sold by the American agencies of the Dutch bulb houses. The same remark will apply to most other species, except *C. latifolium.* Perhaps a form of the next.

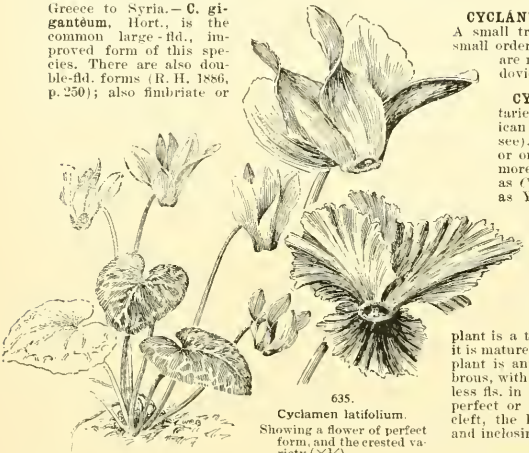
Neapolitànum, Ten. Tuber very large, black, thick-rinded: lvs. variable, from hastate to round-reniform, more or less wavy-plaited on the edges, green or somewhat parti-colored: calyx small: corolla pink or rarely white, the segments short and twisted and the edges raised and white-edged at the base. S. Eu. B.R. 24:49. Gn. 51, p. 37. R.H. 1855:21, as *C. hederæfolium.*

Europæ̀um, Linn. (*C. Clùsii*, Lindl.). Lvs. ovate-orbicular, entire or nearly so, with a deep and narrow basal sinus, more or less white-marbled above, purple-tinted beneath: fls. on scapes 4–5 in. high, bright red and very fragrant, the corolla-segments oblong-spatulate (¾in. or less long); calyx glabrous. Central and S. Eu. B.R. 12:1013.—Lvs. appearing with the fls. Variable.

Cilicicum, Boiss. & Heldr. Much like *C. Europæum:* fls. white, with purple at the mouth, about twice larger; calyx puberulent. Sicily G.C. III. 23:81.

AA. *Spring-blooming species.*

latifòlium, Sibth. & Sm. (*C. Pérsicum*, Mill.). Fig. 635. The common greenhouse or Persian Cyclamen, in many forms: lvs. appearing with the fls., ovate, crenate-dentate, usually marbled or variegated with white: fls. on scapes 6–7 in. high, large, scentless, white, purple-blotched at the mouth, but varying into rose-colored, purple and spotted forms, oblong-spatulate in shape, not eared or lobed at the base. Greece to Syria.—**C. gigantèum**, Hort., is the common large-fld., improved form of this species. There are also double-fld. forms (R. H. 1886, p. 250); also fimbriate or crested forms, *C. Papílio* (I.H. 43:63. G.F. 5:235. G.C. III. 21:71; 23:173). *C. Aléppicum*, Fisch., is a form of it. F.S. 22:2345. Other portraits of *C. latifolium* are: I.H. 35:43. Gn. 47:1016; 48:1030. J.H. III. 34:578. Gt. 1895, p. 203; 1896, p. 164. F.S. 22:2345. A.G. 14:390–392; 17:261. A.F. 7:521–525; 11:1176–9; 12:499.



635. Cyclamen latifolium.

Showing a flower of perfect form, and the crested variety (×½).

Còum, Mill. Tuber smaller than in the last: lvs. with the fls., nearly orbicular, entire, firm, not marbled nor variegated: fls. small, deep red, scentless, half or less as large as those of the last. S. Eu. B.M. 4. F.S. 22:2345.—There is a white-fld. form (*C. album*, Hort.).

Ibèricum, Goldie. Dwarf: lvs. appearing with the fls., ovate-orbicular and rounded at the apex, entire or obscurely undulate, more or less zoned with white above: fls. red, with a purple mouth. Caucasus.—Perhaps a geographical form of *C. Coum*. **C. Atkinsii**, Hort., is a form (perhaps a hybrid) with larger white fls. F.S. 23:2425.

C. hederæfolium, Hort. (and Ait.?), is C. Neapolitanum.—*C. Libanóticum*, Hild., is a new hardy species from Lebanon, with "large, rosy fls., with T-form deep carmine markings at the base of the petals" (see Bot. Jahrb. 25:477).—*C. repándum*, Hort. (not Sibth. & Sm.)=C. Coum?—*C. vérnum*, Sweet=C. Coum.

L. H. B.

CYCLANTHÈRA (Greek, *anthers in a circle*). *Cucurbitàceæ*. This genus is interesting as a plant with a fruit that explodes with a considerable noise when ripe. The plant is a climbing half-hardy annual of easy culture. The seed should be started indoors early. The genus is near Echinocystis and Elaterium, and has 30 or more species, all from tropical America. They are annual, climbing herbs, glabrous or pubescent, with a perennial root: lvs. entire, lobed or 5–7 foliolate: fls. minute, yellow, greenish or white, with their parts in 6's. Monograph by Coigneaux in DC. Mon. Phan. 3:822 (1881).

explòdens, Naud. Stem slender, branched, angled or furrowed, slightly villous, especially at the joints, 6–8 ft. long: lvs. 2½–3 in. long, and about as wide, ovate-triangular, dark green above, a little paler below; slightly 3-lobed; lobes triangular or ovate-oblong, the middle one acute, the side lobes much shorter, obtuse, acute or almost wanting; margin of lvs. with minute, remote teeth: male fls. minute, crowded into few-fld. racemes, which are usually shorter than the petiole: fr. ovate-reniform, obtuse, with a few short spines in the back; seeds small, black, narrowly winged. New Granada.

CYCLÁNTHUS (*flowers in a circle*). *Cyclanthàceæ*. A small tropical American genus, giving name to a small order which is allied to the palms. The species are not in the Amer. trade. Culture of Carludovica (which see).

CYCLOBÒTHRA (name referring to the nectaries). *Liliàceæ*. A small group of west American plants, now referred to Calochortus (which see). The fls. are open-campanulate, with naked or only sparsely hairy nectar glands, the sepals more or less pitted. *C. flàva*, Lindl. (now known as *Calochortus flavus*, Schult.), is in the trade as YELLOW SHELL-FLOWER. Stem rather tall, branching, with small, yellow black-dotted fls.: lvs. narrow-linear. Mex.

CYCLOLÒMA (Greek for *circle* and *border*, from the encircling wing of the calyx). *Chenopodiàceæ*. One weedy herb (*C. platyphýllum*, Moq.) of sandy soils from Minn., west and south, which was once introduced as the Cyclone Plant, since the plant is a tumble-weed or rolls before the wind when it is matured and becomes detached from the soil. The plant is annual, 1–2 ft. high, pubescent or nearly glabrous, with narrow, but flat and sinuate lvs., and bractless fls. in an open panicle. The fls. are very small, perfect or sometimes lacking the stamens; calyx 5-cleft, the lobes strongly keeled and becoming winged and inclosing the seed. Plant not fleshy nor jointed.

CYCNÒCHES (*swan's neck*, from the Greek, referring to the curved column). *Orchidàceæ*, tribe *Vándeæ*. SWAN ORCHID. An interesting genus of deciduous orchids found in tropical America. Pseudobulbs long, fusiform: lvs. lanceolate, plicate, labellum continuous with column; column arcuate, terete, flattening out and becoming clavate at the apex; pollinia 2. The flowers are of different sexes. The same plant may produce male and female flowers. One kind of flower may be fragrant, the other kind scentless. Staminate flowers usually smaller than pistillate flowers; ovary of pistillate flowers thickish. Staminate flowers more numerous than pistillate flowers. About a dozen species. Cult. like Catasetum, either in pots or baskets. Prop. by dividing the pseudo-bulbs just as growth begins. Very few forms are in cultivation in America, due to the want of brilliancy in the flowers. Some of the species produce varying flowers on different racemes on the same plant.

aùreum, Lindl. & Paxt. Fls. numerous, large and yellow, drooping; sepals and petals lanceolate, purple-dotted, the petals curved; lip small and much divided, the column purple-dotted. Cent. Amer.

chlorochìlon, Lindl. Racemes about 3-flowered: fls. large, nodding, 5–8 in. across, green; sepals oval-oblong; petals falcate, slightly larger, labellum subsessile rather obovate and concave at base, yellowish green except at the base; column slender, with a wide base, greenish. Venezuela. I.H. 35:65. J.H. III. 35:285. Gn. 49, p. 403; 51:1108 and p. 173.

pentadáctylon, Lindl. Fls. greenish or white, barred or blotched with brown; labellum partly white, spotted with crimson; column purple below the anther. Rio de Janeiro. B.R. 29:22.

ventricòsum, Batem. Raceme (often 2) about 5-fld.: fls. greenish yellow, fragrant; lip white, with a black callous spot on the claw. Guatemala.

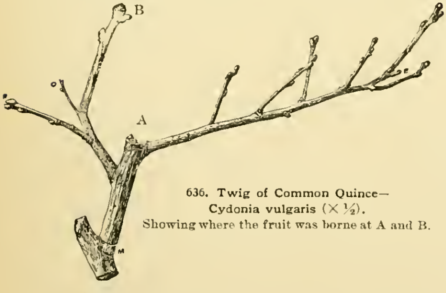
OAKES AMES.

CYDÒNIA (the fruits known to the Romans as *mala Cydonia*, apples from Cydon, now Canea, in Crete). *Rosàceæ*, sub-family *Pomàceæ*. QUINCE. Shrubs or small trees, sometimes spiny: lvs. petioled, deciduous or semi-persistent, alternate, stipulate, serrate or entire: fls. white or red, rather large, solitary or in few-fld. clusters; petals 5; stamens numerous: fr. aromatic, a large 5-celled pome, each cell containing many seeds. Four species in Asia from Turkestan to Jap. Ornamental shrubs, nearly hardy north except *C. Sinensis*, which can only be grown south. *C. Japonica* and *Maulei*, with handsome glossy foliage and abundant fls. in early spring, varying in all shades from pure white to deep scarlet, are highly decorative, and especially adapted for borders of shrubberies and for low ornamental hedges. The fr. of all species can be made into conserves, but usually only *C. vulgaris*, a species of less decorative value, is grown for this purpose. The Quinces thrive in almost any soil, but require sunny position to bloom abundantly. Prop. by seeds usually stratified and sown in spring; *C. Japonica* and *C. Maulei* are readily increased by root-cuttings made in fall or early spring, and rarer kinds or less vigorous-growing varieties are grafted in the greenhouse in early spring, on stock of the Japanese or common Quince; they grow also from cuttings of half-ripened or nearly mature wood, under glass and from layers. *C. vulgaris* (the Quince) is mostly increased by cuttings of 1-4-year-old wood, taken in fall and stored until spring in sand or moss in a cellar or frame; also by layers and budding, or by grafting on vigorous growing varieties. See *Quince*.

A. *Fls. solitary, on short leafy branchlets, with reflexed serrate calyx lobes: stipules small. (Cydonia proper.)*

vulgàris, Pers. (*Pỳrus Cydònia*, Linn.). QUINCE. Fig. 636. Shrub or small tree, with slender, spineless branches: lvs. oval or oblong, rounded or slightly cordate at the base, acute, entire, villous-pubescent beneath, 2-4 in. long: fls. white or light pink, 2 in. across: fr. large, yellow, villous, pyriform or globular. May. Cent. and E. Asia.—Var. **Lusitánica**, Mill., is of more vigorous growth, with larger lvs. and fr. pear-shaped and ribbed. Var. **malifòrmis** has apple-shaped, and var. **pyrifórmis** pear-shaped fr. Var. **marmoràta**, Hort., has whitish and yellow variegated lvs. See also *Quince*.

Sinènsis, Thouin (*Pỳrus Cathayénsis*, Hemsl.). Shrub or small tree: lvs. elliptic-ovate or elliptic-oblong, acute at both ends, sharply and finely serrate, villous beneath when young, 2-3 in. long: fls. light pink, about 1⅓ in. across: fr. dark yellow, oblong, 4-6 in. long. May. China. B.R. 11:905. R.H. 1889:228. A.G. 12:16.—The lvs. assume a scarlet fall coloring. Not hardy north of Philadelphia, except in favored localities. See *Quince*.



636. Twig of Common Quince—Cydonia vulgaris (× ½).
Showing where the fruit was borne at A and B.

AA. *Fls. in leafless clusters, nearly sessile, before or with the lvs.: calyx lobes erect, entire: stipules large. (Chænomeles.)*

Japónica, Pers. (*Pỳrus Japónica*, Thunbg. *Chænomèles Japónica*, Lindl.). JAPAN QUINCE. JAPONICA. Fig. 637. Shrub, 3-6 ft., with spreading, spiny branches: lvs. ovate or oblong, acute, sharply serrate, glabrous, glossy above, 1½-3 in. long: fls. in 2-6-fld. clusters, scarlet-red in the type, 1½-2 in. across: fr. globular or ovoid, 1½-2 in. high, yellowish green. March, April. China, Jap. R.B. 1:260. L.B.C. 16:1594. Gn. 50:106.—Many garden forms in all shades from white to deep scarlet, and also with double fls. Some of the best are the following: Var. **álba**, Lodd., fls. white, blushed. L.B.C. 6:541. Var. **atrosanguinea plèna**, deep scarlet, double. Var. **cándida**, pure white. Var. **cardinàlis**, deep scarlet. R.H. 1872:330 f. 1. Var. **Gaujárdi**, salmon-orange. Var. **grandiflòra**, nearly white, large fls. R.H. 1876:410. Var. **Mállardi**, fls. rose, bordered white. Var. **péndula**, Hort., with slender, pendulous branches. Var. **ròsea plèna**, rose, semi-double. Var. **rùbra grandiflòra**, fls. large, deep crimson. Var. **sanguínea plèna**, scarlet, double. Var. **umbilicàta**, with rose-red fls., and large frs. umbilicate at the apex.

637. Cydonia Japonica (×½).

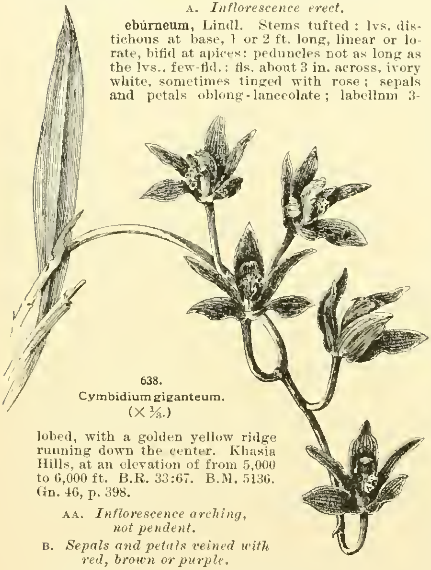
Maùlei, Nichols. (*Pỳrus Maùlei*, Mast. *Chænomèles alpìna*, Koehne). Low shrub, 1-3 ft.: branches spiny, with short, rough tomentum when young: lvs. roundish oval to obovate, obtuse or acute, coarsely crenate-serrate, glabrous, 1-2 in. long: fls. bright orange-scarlet, 1-1½ in. across: fr. yellow, nearly globular, about 1½ in. across. March, April. Jap. B.M. 6780. G.C. II. 1:757 and 2:741.—A very desirable hardy shrub, with abundant fls. of a peculiar shade of red. Var. **alpìna**, Rehder (*Chænomèles Japónica*, var. *alpìna*, Maxim. *Cydònia Sárgenti*, Lem.). Dwarf spiny shrub, with procumbent stems and ascending branches: lvs. roundish oval, ½-1 in. long: flowering and fruiting profusely. Var. **supèrba**, Hort. Fls. deeper red. Var. **trícolor**, dwarf shrub, with pink and white variegated lvs. ALFRED REHDER.

CYMBÍDIUM (*boat*, from the Greek, referring to the shape of the lip). *Orchidàceæ*, tribe *Vándeæ*. Plants epiphytal, rarely terrestrial, stems pseudobulbous or not so: leaves coriaceous, long, rarely short, persistent: sepals and petals sub-equal, labellum usually tri-lobed, adnate to the base of the column; column erect; pollinia 2. Species, tropical, sub-tropical, found on mountains at high elevations in Asia. A few species are found in Africa and Australia. For horticultural purposes this genus is of comparatively little value. OAKES AMES.

No difficulty will be experienced in growing the several species of Cymbidium under one method of treatment. A shaded position in the Mexican house or cool end of the Cattleya department, where the temperature ranges between 50° and 55° Fahr. at night and about 65° or with sun heat 70° through the day will be found suitable. During the warm summer months they must be kept shaded in a cool, moist atmosphere with a free circulation of air. As they are robust growing plants, pot culture will suit them best, but those with pendulous inflorescence, such as *C. Findlaysonianum*, *C. pendulum*, etc., may be grown in baskets if desired. Repotting and top-dressing should be attended to in spring at the commencement of the growing season, and should be executed with judgment, so that it will last three or four years, as the roots dislike being disturbed. The potting soil should consist of one-half chopped sod, the balance of equal parts leaf-mold, peat and live chopped sphagnum moss, well mixed together; about one-third of the pot room should be devoted to drainage—potsherds or charcoal, covering the same with a little rough material to keep it open. When the large, fleshy roots are carefully distributed the material should be worked in firmly about them, leaving the base of the plant on a level with the rim of the pot when finished. Water sparingly until the new growths appear, when a more liberal supply will be necessary, but never enough to keep the soil constantly wet, or the new roots are liable to decay and the foliage to become spotted. Stock is increased by removing the old pseudobulbs, potting them up in small pots and giving them a little more heat and moisture until they start new growth action, when they may be removed to their proper department. Robert M. Grey.

A. *Inflorescence erect.*

ebúrneum, Lindl. Stems tufted: lvs. distichous at base, 1 or 2 ft. long, linear or lorate, bifid at apices: peduncles not as long as the lvs., few-fld.: fls. about 3 in. across, ivory white, sometimes tinged with rose; sepals and petals oblong-lanceolate; labellum 3-lobed, with a golden yellow ridge running down the center. Khasia Hills, at an elevation of from 5,000 to 6,000 ft. B.R. 33:67. B.M. 5136. Gn. 46, p. 398.



638. Cymbidium giganteum. (× ⅛.)

AA. *Inflorescence arching, not pendent.*

B. *Sepals and petals veined with red, brown or purple.*

Lowiànum, Reichb. f. Pseudobulbs oblong: lvs. 2–3 ft. long, linear-acute, recurved: racemes many-fld.: sepals and petals oblong-lanceolate (lateral ones sub-falcate), greenish yellow marked with brown; lateral lobes of labellum yellowish; midlobe reflexed, margined with yellow, the front blotched with brown-crimson; fls. about 20 in number, several inches across. Burma. Gn. 48, p. 263. Gng. 5:73.—Var. **Mandaiànum**, Hort. (*C. Mandaiànum*, Hort.), has yellow fls. A beautiful hybrid of *C. eburneum* and *C. Lowianum* is shown in Gn. 48:1034.

gigantèum, Wall. Fig. 638. Fls. dull purple (brownish, or yellowish green striped with purple); sepals and petals oblong, the petals narrow and shorter; midlobe of labellum reflexed, yellow, spotted with red; lateral lobes yellowish green. Nepal. B.M. 4844. P.M. 12:241.

longifòlium, Don. Lvs. linear-acuminate: peduncle stout, sub-erect, then drooping: fls. about 12; sepals sub-equal, oblong, the upper one broadest and incurved; both sepals and petals green striped with brownish purple; disk and midlobe of labellum white, spotted with purple; lateral lobes with purple lines. Ind.

ensifòlium, Swartz. Lvs. ensiform, acute: peduncle many-fld.: fls. greenish yellow, veined with purple; sepals and petals linear-oblong, acute; labellum spotted. Ind., Jap. B.M. 1751.

Hùttonii, Hook. f. Plant about 2 ft. high: fls. 10, in drooping racemes; sepals yellow, striated with brown; petals brown; labellum greenish, dotted with brown. Java. B.M. 5676.

BB. *Sepals and petals not veined with purple or brown.*

tigrìnum, Parish. Lvs. oblong-lanceolate: peduncles slender, 3–6-fld.: sepals and petals linear-oblong, acute, green spotted at base; petals often paler and with more spots than the sepals; labellum with yellow, red-brown striped lateral lobes; midlobe white, transversely streaked with purple. Burma. B.M. 5457.

Hookeriànum, Reichb. f. Lvs. about 2 ft. long, acute: peduncle arching above, erect at base: fls. from 6–12, large; sepals and petals oblong, greenish; labellum yellow, spotted with purple. Sikkim. B.M. 5574.

BBB. *Sepals and petals whitish.*

Mástersii, Griff. (*Cyperórchis Mástersii*, Benth.). Lvs. linear, acuminate: peduncle stout, longer than the raceme: sepals and petals sub-equal, oblong-lanceolate, white, flushed with rose at the apices; labellum minutely pubescent; lamellæ orange-yellow. Sikkim. B.R. 31:50. Var. **álbum**, Hort., has white fls. **C. álbaflòra**, of Amer. trade, is equivalent to *C. Mastersii*, var. *album*.

AAA. *Inflorescence pendent.*

péndulum, Swartz. The leathery lvs. distichous, 2–3 ft. long, broadly linear: fls. yellowish; side lobes and midlobe of labellum rose-color; the disk more or less white with yellow crests; sepals and petals narrowly oblong, with a purple median line. E. Ind.

Finlaysoniànum, Lindl. (*C. péndulum*, Lindl.). Lvs. ensiform: raceme many-fld: sepals and petals linear-oblong, obtuse, dull yellow sometimes, with a reddish median line; lateral lobes of labellum crimson; midlobe white, tipped with crimson. Malaysia.—Var. **atropurpùreum**, Hort. Lvs. narrower, racemes longer, with larger fls.: sepals and petals purplish, front lobe of labellum white, spotted with purple. Borneo.

C. aloifòlium, Swz., with pale purple fls., and *C. virèscens*, Lindl. (C. virens, Reichb. f.), with greenish sepals and petals and yellow, red-blotched lip, are offered by importers of Japanese plants.—*C. Líndleyi* is a name which has appeared in the Amer. trade, but which is not identified.—For *C. Sandersoni* see Ansellia. Oakes Ames.

CYNÁNCHUM (Greek, *dog poison*). *Asclepiadàceæ.* About 20 species in S. Eu., Africa, Asia and Australia, herbaceous or sometimes half woody at the base, twining. Lvs. opposite, entire. Plant very like Vincetoxicum, but the fls. differ in having a scale or ligule on the inside of each of the 5 parts of the crown.

acuminatifòlium, Hemsl. (*Vincetóxicum acuminàtum*, Decne. *V. Japónicum*, Hort.). Mosquito Plant. Cruel Plant. Perennial: erect or nearly so, or the tips showing a somewhat twining habit: the stems grayish and more or less angular: lvs. opposite, broadly ovate and acuminate, short-petioled, strongly pinnate-veined, entire, usually conspicuously gray-pubescent beneath: fl.-clusters lateral (1–2 between the lvs.), shorter than the lvs.: fls. white, small, in umbel-like cymes: fr. a milkweed-like follicle. Japan.—In the flowers, mosquitoes and other insects are caught, much as they are in other asclepiadaceous plants. The native *Amsonia Tabernæmontana* is sometimes sold as this plant, and it has been figured as such. L. H. B.

CYNÀRA (involucre spines likened to a dog's tooth). *Compósitæ.* A half-dozen S. European species, of which the Artichoke and Cardoon (which see) are cultivated.

CÝNODON. See *Capriola.*

CYNOGLÓSSUM (Greek, *hound's tongue*, from the shape and soft surface of the lvs. of the commonest species). *Borragináceæ.* A large and widely dispersed group of little horticultural interest, being mostly tall, coarse, weedy herbs. *C. officinàle*, Linn., Fig. 639, has a bur that becomes attached to clothing and to the fleece of sheep. It is a biennial weed, naturalized from the Old World, grows about 2 ft. high in pastures and waste places of the Atlantic states, and has soft-pubescent, lanceolate lvs., and dull red-purple (sometimes white) fls. in panicled racemes. *C. gránde*, Dougl. Once cult. from California as a hardy border perennial; grows about 2 ft. high, with lower lvs. ovate-oblong, or somewhat heart-shaped at the base, acute or acuminate, 4–8 in. long, on margined petioles of about the same length: upper lvs. smaller, ovate to lanceolate, abruptly contracted into shorter winged petioles: fls. violet or blue. For *C. Appennìnum*, Linn., see *Solenanthus.*

639. Bur of Hound's-tongue or Stick-tight. (× 3.)

CYNÓRCHIS (Greek for *dog orchid*). *Orchidàceæ*, tribe *Ophrýdeæ.* A dozen Habenaria-like African orchids, not in the Am. trade. Culture of Bletia. Not to be confused with Cycnoches.

CYNOSÙRUS (Greek, *dog's tail*). *Gramíneæ.* Annual or perennial, cespitose grasses, with flat leaves. Spikelets of two forms in small fascicles, these forming a dense somewhat unilateral, spike-like panicle; terminal spikelets of the fascicles 2–4 fld., hermaphrodite; lower spikelets sterile, consisting of many empty glumes: flowering-glumes mucronate or awn-pointed: stamens 3. Species 4 or 5, in the north temperate regions of the Old World.

cristàtus, Linn. Crested Dog's-tail. A slightly tufted perennial grass, 1–2 ft. high, with narrow lvs. and a rather slender, erect, spike-like panicle. Int. from Europe.—Well adapted for shaded lawns and woodlands. Also recommended for mixed pastures, especially in hilly regions. The mature stems are used in the manufacture of Leghorn hats.

élegans, Desf. Silky-awned Dog's-tail. A pretty perennial grass varying in height from 6 in.–1½ ft.: lvs. small and scarce: panicle one-sided and spike-like: spikelets with long white silky awns ½–1 in. long. Int. from Europe.—Handsome for dry bouquets.

P. B. Kennedy.

CÝNTHIA. All referred to *Krigia.*

CYPÉLLA (application obscure). *Iridàceæ.* Eight species of South American bulbs, inferior to Iris for general culture because not hardy, and also less showy. The genus differs from Iris and Moræa in its stigmas, which are neither petal-like nor filiform, but erect, and in the anthers, which are broad, erect, not sloped, bearing the pollen on their edges, also in the plaited leaves. *C. Herberti* is the only species offered by the American trade, and the catalogues say it comes from Peru, but, according to Baker (Irideæ, p. 62), the only species from the western coast of South America is *C. Peruviana.* The bulbs should be set out in spring, lifted in fall and stored over winter. Prop. by offsets or by seed, which should be sown as soon as ripe. The blue-flowered species are presumably equally worthy of culture, though *C. plumbea*, Lindl., from S. Brazil and Argentine, is shown in B.M. 3710, with dull, lead-colored fls. In F.S. 4:395 and 14:1466 the colors are showier, the latter being a variety with handsome purple streaks. For the still showier *C. cærulea*, Seub., see *Marica.*

A. *Style appendages spur-like.*

Hérberti, Herb. Lvs. about 1 ft. long, linear, acuminate, twice plaited, the angles of the plaits winged: scape 2–3 ft. high, erect, flexuose, glaucous, branched, many-fld.: fls. 3 in. across, chiefly yellow, odorless, soon withering; outer segments bearing a rather long cusp or tail. South Brazil. Uruguay. Argentine. B.R. 11:949 and B.M. 2599 show utterly distinct colors, but Baker says there is a lilac variety.

AA. *Style appendages petal-like, flat.*

Peruviàna, Baker. Lvs. 6–9 in. long, linear, narrowed gradually from the middle both ways, glabrous, plaited: fls. 2–3 in a solitary stalked cluster, soon withering, chiefly yellow; segments with a distinct long claw and a proportionately shorter and broader blade and a shorter cusp, at the base spotted brown. Peru. B.M. 6213.

W. M.

CYPERÓRCHIS (*Cyperus* and *Orchis*, from the sedge-like appearance). *Orchidàceæ*, tribe *Vándeæ.* Very closely allied to Cymbidium, which see. There are only three species, of which *C. Mástersii*, Benth. (*Cymbidium Mastersii*, Griff., of this work, and *C. elegans*, Blume (*Cymbidium elegans*, Lindl., B.M. 7007) are cult. The latter does not appear in the Amer. trade.

CYPÈRUS (ancient Greek name). *Cyperàceæ.* A large genus of the Sedge family, inhabiting both tropical and temperate regions. The species in cultivation are all perennials from rootstocks or tubers: leaves grass-like; stem simple and mostly naked above: flowers perfect, without perianth, borne in small, compressed spikes, which are variously aggregated in compound umbels, the latter surrounded by foliaceous bracts; styles and stamens 3. A few are cultivated in jardinieres, aquatic gardens and aquaria. Several others are pests in cultivated fields.

A. *Basal leaf-sheaths without blades.*

alternifòlius, Linn. Umbrella Plant. Umbrella Palm. Fig. 640. Strict, 1½–3½ ft. high: stem nearly terete, ribbed, smooth and slender: involucral lvs. very numerous, spreading or slightly drooping, linear, 8 in. long, ¼–½ in. broad, dark green, acute, rough-margined: umbel rays only 1–2 in. long, nearly simple: spikes few, in a cluster, ovate, very flat, 2 lines long, pale brown: scale acute: rachis winged and pitted. Madagascar.—Much used for aquaria and jardinieres. Var. **variegàtus**, Hort. Stem and lvs. striate, sometimes entirely white. Var. **grácilis**, Hort. Involucral lvs. much narrower and not so spreading.

640. Cyperus alternifolius, or Umbrella Plant.

Papỳrus, Linn. (*Papỳrus Antiquòrum*, Willd.). Egyptian Paper-plant. Strict, tall and stout, 4–8 ft. high, dark-green: stem obtusely 3-angled, smooth: involucral lvs. only 3–10, small, 3–6 in. long, ¼–½ in. wide, linear, acute: primary rays of the umbel very numerous, terete, slender, equal and drooping, 10–16 in. long: secondary bracts prominent, filiform, 2–6 in. long: spikes clustered and sessile, pale chestnut: rachis wingless. Egypt, Palestine.—For aquaria and damp soil. Not hardy.

AA. *Basal sheaths blade-bearing.*

B. *Lower lvs. few, very broad and conduplicate.*

Natalénsis, Hochst. Stem 2½ ft. high, smooth, with 1–3 leaf-bearing sheaths and several leafless ones at the base: involucre 2–3-lvd., short: rays of the umbel short, unequal: spikes much congested, numerous, linear-lanceolate, acuminate, pale brown, 10–12-fld.: rachis winged: scales oblong-ovate, obtuse. South Africa.—Decorative. Not hardy.

fértilis, Borck. Stem short, slender, 4–5 in. high, 3-angled: lvs. numerous, thin and broad, 4–9 lines wide, 6 in. long, equaling the stem, linear-lanceolate, folded below, dotted, margin denticulate: umbel simple, 5–7-rayed: rays elongated, pendulous, often rooting at the apex, 1–2 ft. long: involucral bracts short: spikelets crowded, oblong-lanceolate, obtuse, slightly compressed, white. Central Africa.—Recently introduced, and fine for hanging baskets; the umbel-rays often bear plantlets instead of flowers.

lùcidus, R. Br. Rather stout: stem 1–2 ft. high, terete above: lvs. numerous, large and broad, spongy-thickened at the base, spinulose-margined: umbel spherical, 6–8 in. in diam.: spikelets dense, digitate, long and linear: scales persistent: axis continuous. Australia.

BB. *Lower lvs. numerous, narrow and grass-like, flat or nearly so.*

élegans, Linn. (*C. láxus*, Lam. and Hort.). Stem 3-angled, 2–3 ft. high: lvs. large, broadly linear, numerous, spreading, half as long as the culm: involucre short, spreading, few-lvd.: rays long and slender, unequal, compound: spikes small, distant, oblong, greenish brown, blunt, 6–11-fld.: scales round-elliptic, mucronate. West Indies, Brazil. G. C. II. 2:99; III. 13:41.—For table decoration.

strigòsus, Linn. Stout, 1–3 ft. high, sharply 3-angled, base bulbous: lvs. numerous, long and grass-like, smooth, 2–4 lines wide; involucral similar, 6–12 in. long: rays very unequal, 6 in. or less long: spikes 4–10-fld., awl-shaped, chestnut-brown, densely clustered, at the spike-like (1–1½ in. long) tips of the rays. N. Amer.—Hardy perennial, used for the borders of aquatic gardens.

esculéntus, Linn. Chufa. Much like the last: rootstock slender and bearing little tubers: spikes pale: akene obovoid. Tropics.—Sometimes a weed in sandy fields; also cult. south for the edible tubers. Not hardy.

pùngens, Borck. Stem very short and thick, 1–2 in. long, angled below: lvs. equaling the stem, rigid: umbel simple, contracted or capitate: spikelets linear-lanceolate, compressed, shining, straw-colored, 10–18-fld.: involucral bracts 2–4, scarcely 1 in. long. North Africa.—Recently introduced. May be used for hanging baskets.

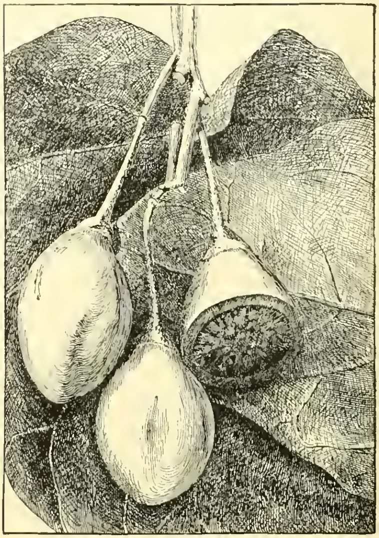
C. compréssus, Linn. Umbel lax: spikes linear-oblong: scales acuminate. Trop.—*C. flabellifórmis*, Rottb. Rare in Amer. trade. Central Africa.—Tall and palm-like, used by natives for wickerwork; very ornamental in water gardens.—*C. rotúndus*, Linn. Nut-grass. Coco-grass. Like C. esculentus, but spikes darker and akene linear. Weed in cult. fields.—*C. strictus*, Hort.=?

K. M. Wiegand.

CYPHOMÁNDRA (from the Greek, referring to the hump-shaped anthers). *Solanàceæ.* Two dozen S. American spineless shrubs or small trees (essentially herbs in culture in the north), distinguished from Solanum chiefly by the thickened anthers. The large lvs. are entire, 3-lobed, or pinnatisect.

betàcea, Sendt. (*Solànum fràgrans*, Hook.). Tree Tomato. Fig. 641. Cult. occasionally for the egg-shaped, reddish brown, faintly striped fruits, and under such conditions it becomes a tree-shaped, half-woody plant 6–10 ft. high: lvs. large, soft-pubescent, cordate-ovate; more or less acuminate, entire: fls. small, pinkish, fragrant, in small axillary or super-axillary clusters: fr. about 2 in. long, on slender stalks, 2-loculed and seedy, musky-acid and tomato-like in flavor, agreeable to those who like tomatoes. Brazil. B.M. 3684. J. H. III. 31:470. G.C. III. 25:105. A.G. 11:409.—Bears the second and third year from seed, under glass (where it must be grown in the northern states). For further notes, see Bailey, Forcing-Book.

L. H. B.



641. Cyphomandra betacea (× ½).

CYPHOPHŒ̀NIX, (*hump* and *Phœnix*, a palm). *Palmàceæ*, tribe *Arèceæ*. A genus of only 2 species of palms of minor importance. Spineless palms with a stout, ringed caudex. Leaves terminal, pinnatisect, the segments coriaceous, elongated, sword-shaped, narrowed toward the apex, the margins thickened, plicate, recurved at the base; the prominent nerves and midrib sparsely scaly beneath; rachis stout, rather broad, slightly convex on the back, acute above: spadices glabrous, the branches long, stout: bracts short; bractlets scaly; fr. dark brown, medium, long-ovoid or ellipsoid, lentiform. Species 2. New Caledonia.

élegans, Benth. & Hook. (*Kéntia élegans*, Brongn. & Gris.). Rachis convex below, flat above; leaflets alternate, approximate, scaly along the mid-nerve below: fr. oblong-elliptical, acute.

fulcìta, Benth. & Hook. (*Kéntia fulcìta*, Brongn.). Stem clothed at the base with smooth aërial roots: fr. ovoid, attenuate above.

CYPHOSPÉRMA (Greek, *hump* and *seed*). *Palmàceæ*, tribe *Arèceæ*. Two Australian warmhouse palms, scarcely known in this country. **C. Viellárdii,** Benth. & Hook., with pinnatisect lvs., and long-ensiform coriaceous segments, is sometimes known as *Kentia robusta* and *K. Viellardii*. Culture of Areca and Ptychosperma.

CYPRESS. See *Chamæcyparis, Cupressus* and *Taxodium*.

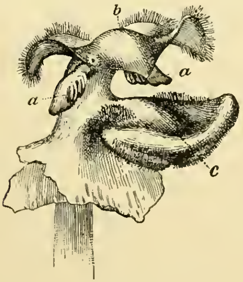
CYPRESS VINE. See *Ipomæa*.

CYPRIPÈDIUM (*Venus' slipper*). LADY'S SLIPPER. MOCCASIN FLOWER. *Orchidàceæ*, tribe *Cypripèdieæ*. The genus Cypripedium is widely distributed, being found in both South and North America, Asia, Europe, Japan, and the Malay Archipelago. At present no species are reported from Australia or Africa. Scapes usually 1-fld.: floral segments fleshy: upper sepal usually larger than the petals: ovary 1-celled: fertile stamens 2; intermediate stamen sterile and petaloideous: column short, cernuate: apex trifid: lateral lobes anther-bearing: pollen viscid or mealy, not compound: stigma deltoid, on front of column beneath the stamens: capsule slender, pubescent: placentation parietal: the lower sepals commonly coalescent: labellum cup-form, inflated: lvs. usually ligulate, either tessellated or uniform green. The structure of the column (or essential organs) of a Cypripedium is shown in Fig. 642. The two anthers are at *a a*. The third stamen is represented by the body, *b*. The stigma is at *c*. The floral envelopes are torn away beneath. The majority of Cypripediums grow well, and increase in value from year to year. They do not require a period of rest like species of Cattleya. The hardy species, such as *C. acaule* and *C. pubescens*, are well worthy of a place in gardens. *C. spectabile*, for color and form, ranks among the finest species. It is a valuable orchid for forcing in the greenhouse. As yet, no hybrids have resulted from the intercrossing of our native Cypripediums. Intercrossing of tropical with hardy species has proved fruitless. There is a tendency to resolve Cypripedium into several genera. For the purposes of this work the old classification will be observed.

The genus is closely akin to Selenipedium, which see for *C. caudatum*, *C. palmifolium*, *C. Rœzlii*, *C. Lindleyanum*, *C. Sargentianum*, *C. Schlimii*, *C. Schomburgkianum*, *C. vittatum*, and the like. See, also, *Houlletia*. Selenipedium differs from Cypripedium in having a 3-loculed and 3-ribbed ovary. Figs. 643 and 644 contrast some of the structural points in the two genera. The genus Cypripedium is naturally not a large one. Bentham and Hooker think that the species are less than 40. The species have been much hybridized and modified by cultivation, however, so that the garden forms are legion. Most of the names represent horticultural varieties; and these names may be expected to increase. One section of the genus has been separated recently as a genus, *Paphiopedilum*. Monogr. of Cypripedium and related genera by F. Desbois, Ghent, 1898.

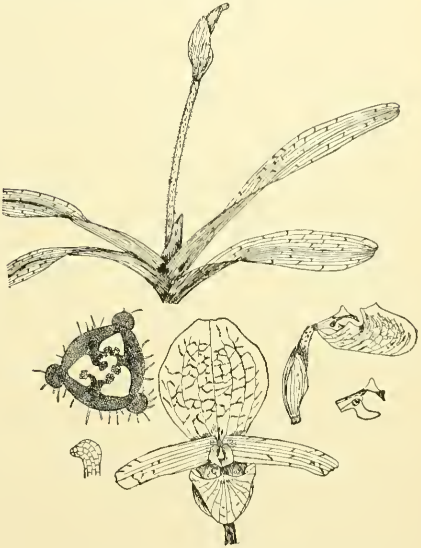
OAKES AMES.

Nearly all Cypripediums are of easy culture and may be readily grown in one department, by devoting the cooler portion to *C. barbatum*, *C. insigne*, *C. Javanicum*, *C. venustum* and the Selenipedium group. The coriaceous-leaved evergreen species are all in more or less active growth the year round; therefore a liberal supply of water must be given at all seasons, only allowing the compost to become dry occasionally to prevent stagnation.



642. Structure of column of Cypripedium (× ¼). C. Dormanianum.

Light syringing should be frequent in bright weather, and an application of weak liquid manure once or twice a week will be found of great assistance to keep the plants in health. The hygrometer should never register below 60, nor often above 80, as moisture in excess of 80 is liable to damp-off the young growths. Ventilation regulated according to external conditions is essential at all times to maintain atmospheric action.



643. Cypripedium Charlesworthii.
Shows section of ovary; of labellum or lip on the right; stigma on the left; column on the right below.

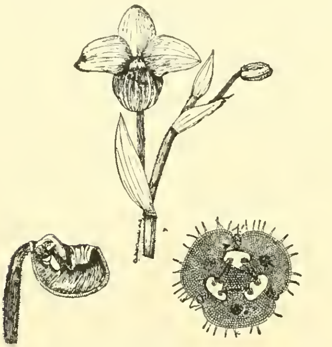
During the winter months the thermometer should register from 60° F. to 65° F. by night and about 70° F. by day. With sun heat a few degrees more will do no harm. On the approach of spring the temperature should be advanced to prepare the plants for summer heat, and accordingly decreased on the approach of fall. About the middle of February a light shading will be necessary to prevent excessive heat and sunburn, with heavier shading toward midsummer, this to be gradually removed in the fall and entirely dispensed with during the winter.

The greater part of the species grow best in pots in a compost of two parts peat-fiber to one part chopped living sphagnum moss, one-half of the pot room being devoted to clean drainage. The compost should be pressed in rather firmly about the roots, and the surface left convex to discard surplus water and to insure the base of the plant against decay during dull weather. A few heads of living moss pricked in over the surface will give a neat appearance.

Cypripedium insigne and kindred species should have one-third chopped sod added to the above mixture (see note on culture in Veitch's Orchid Manual 2: 34). *C. villosum* and *C. Exul* sometimes suffer under pot culture from fungi, which attack the base of the plant during sultry summer weather. Basket culture will obviate this, as it allows a better circulation of air through the compost. *C. Lowei*, *C. Parishii*, *C. Philippinense* and allied species, together with *Selenipedium caudatum*, are truly epiphytic and preferably should be grown in baskets. By this method the roots are better preserved and less liable to decay during the winter season.

The Concolor section requires a warm, moist location with free access to the air. The species should be grown in rather small pots, with at least half the space devoted to drainage of broken charcoal or other free material. The potting compost should consist of equal parts chopped sod, peat-fiber and living sphagnum. Limestone is often recommended as essential in the culture of this section, but, the conditions being equal, I have never noticed any beneficial results from it (Orchid Review 4: 45; Veitch's Manual 2: 19-20).

The deciduous tropical species, of which *C. Irapeanum*, *C. Thibeticum* and *Selenipedium palmifolium* afford good examples, require similar treatment to the evergreen kinds. They have a long dormant period during which they should be rested in a temperature of 50° F., with sufficient water to keep the compost moist until growth starts, when they must be returned to their proper department and enjoy a liberal supply of water until after the flowering season, when they must be ripened off and the water supply gradually withheld.



644. Selenipedium Schlimii.
The picture shows on the left a section of the labellum; on the right, a section of the ovary.

The hardy species do better planted out in the open ground or in rockeries, where they should be so situated as to obtain good drainage and shade. The soil must be free and porous and consist of three parts chopped turf and equal parts of peat and sphagnum. They require a liberal amount of water and frequent syringing over the foliage while growing, but the supply should be gradually reduced after the flowering period until only enough water is given to keep the soil moist. During the winter the plants should be protected with leaves or pine boughs. *C. spectabile* and *C. pubescens* grow well under pot culture. A 7-10-inch pot will hold eight or a dozen crowns, which should be planted 2 inches below the surface. Two inches of drainage are sufficient. The pots should be filled with soil (firmly pressed in) to ½ inch below the rim. After a thorough watering they should be stored in a coldframe and protected with leaves and boughs. About the middle of February they may be removed to a coolhouse, where they should remain for a week, and then be placed in the cool end of the Cypripedium house, where they should be watered sparingly until growth action starts. These plants make strong growths under this treatment, and the flowers are a decided improvement over those produced normally outside.

All Cypripediums are propagated by division.

ROBERT M. GREY.

Index to species described in the main list: Abbotianum, 5; acaule, 40; albens, 25; Amesianum, 25; Appletonianum, 16; Argus, 6; arietinum, 43; Arnoldianum, 25; atropurpureum, 5; aureum, 25; auriculum, 5; barbatum, 1; bellatulum, 20; biflorum, 1; Boxalli, 28; Breevisianum, 25; Brownii, 25; Bullenianum, 15; Calceolus, 48; candidum, 46; Californicum, 52; callosum, 4; caudatum is a Selenipedium; Chamberlainianum, 38; Chantinii, 25; Charlesworthii, 24; ciliolare, 7; cærulescens, 1; coloratum, 5; concolor, 17; corrugatum, 25; Coulsonianum, 25; Cowperianum, 25; Crossianum, 1; Curtisii, 9; Cuttingianum, 25; Dayanum, 12; Dominianum, 25; Dormanianum, 25; Druryi, 27; elegans, 41; Elliottianum, 37; Ernestii, 25; Exul, 26; Eyermanianum, 25; Fairieanum, 21; Færstermanni, 25; fuscatum, 25; giganteum, 1, 5; Gilmoreianum, 25; glanduliferum, 35; Godefroyæ, 19; gracile, 1, 25; grandiflorum, 1; grande, 5; guttatum, 25; Haynaldianum, 31; Hendersonianum, 1; Himalaicum, 44; hirsutissimum, 22; Hookeræ, 15; Horsmanianum, 25; Hyeanum, 5; illustre, 25; insigne, 25; Irapeanum, 54; Javanicum, 13; Japonicum, 42; Kimballianum, 25, 35, 37; lævigatum, 34; Lawrenceanum, 5; leucochilum, 19; Lindeni, 5; longisepalum, 25; Lowei, 30; Lutwycheanum, 25; Macfarlanei, 25; macranthum, 51; maculatum, 25; magnificum, 5; majus, 1; Mandevilleanum, 25; marmoratum, 5; Mastersianum, 14; Maulei, 25; maximum, 25; montanum, 53; Mooreanum, 25; mosaicum, 1; Moulmeinense, 25; nanum, 1; Neo-Guineense, 35; nigritum, 2; nigrum, 1, 5; Nilssonii, 25; nitens, 25; niveum, 18; nobile, 1; O'Brienianum, 1; Parishii, 32; parviflorum, 49; Petri, 12; Philippense, 34; pictum, 1, 5; Pitcherianum, 5, 6; pleioleucum, 5; plumosum, 1; præstans, 35; pubescens, 47; pulcherrimum, 1; purpurascens, 5; purpuratum, 3; purpureum, 1; Pynaerti, 25; roseum, 5; Rothschildianum, 37; Sallieri, 29; Sanderæ, 4, 25; Sanderianum, 36; spectabile, 50; Spicerianum, 23; Stonei, 33; Studleyanum, 25; superbiens, 8, 25; superbum, 1, 5; Sylhetense, 25; Thibeticum, 45; tonsum, 10; Veitchianum, 8; venustum, 11; Victoria-Marie, 39; villosum, 28; virens, 13; virescens, 5; volonteanum, 15; Warnerianum, 1. Many other names are accounted for in the supplementary lists.

A. *Leaves tesselated (or checkered in squares).*

B. *Petals more or less ligulate, smaller than the upper sepal.*

C. *Upper sepal veined with green and purple: spots on the petals marginal.*

1. **barbàtum**, Lindl. Lvs. oblong, about 6 in. long, pale beneath, upper surface dull green with darker green markings: scape long, reddish brown: ovary slender, subtended by a small bract: upper sepal orbicular, evenly reflexed, white, with a green translucent base; veins green part way, becoming deep purple: petals green at the base, finely dotted, gradually passing into brown-pink at the apices, upper margin provided with several blackish warts; labellum brown-purple, infolded portion yellowish or purplish with raised dots; lower sepal narrow, greenish, veined with green: staminode pubescent, broadly crescent-shaped. June and July. Malay Peninsula. B.M. 4234.—Of this useful species there are many excellent varieties in which the flowers are larger or more richly colored. The variation in foliage is very remarkable. In general appearance this species resembles *C. Lawrenceanum*. Many vars. in cult.

The following are varieties of *C. barbatum*: *Biflòrum*. A chance variation, due undoubtedly in most cases to vigor. See Crossianum below.—*Cærulèscens*.—*Crossiànum*. Same as Crossii.—*Cróssii*. Upper sepal very large, round-orbicular, white, veined with green and apparently transversed by a band of crimson; petals much deflexed. I.H. 35:72; 36: 81. A.F. 6:555.—*Gigantèum*=nigrum.—*Grácile*.—*Grandiflòrum*. Upper sepal unusually large.—*Hendersoniànum*.—*Màjus*. A richly colored and vigorous form.—*Mosàicum*.—*Nànum*.—*Nìgrum*. A dark flower, the labellum of a very deep brown-purple.—*Nóbile*.—*O'Brieniànum*, or *O'Brieni*.—*Píctum*.—*Plumòsum*. This is not a permanent variety. It does not maintain the characters to which it owes its name.—*Pulchérrimum*.—*Purpùreum*.—*Supérbum*. Almost any good form of the type is called by this name.—*Warneriànum*, or *Wárnerii*. See Crossii.

2. **nigritum**, Reichb. f. Probably identical with *C. purpuratum*, var. *obscurum*. Dorsal sepal resembles that of *C. purpuratum*, in other respects very similar to *C. barbatum*.

3. **purpuràtum**, Lindl. Lvs. elliptic-oblong to narrowly ovate, 4-5 inches long, glaucous, pale green tesselated with darker dull green, pale beneath: scapes short (about 5 in. long), purplish: ovary subtended by a

small bract ; upper sepal white, 4-angled, appearing as if inserted at one of its angles, about 15-nerved, outer nerves carmine-purple, others metallic green; margins strongly reflexed; lower sepal greenish with white margins, veined with green; petals subspatulate, greenish at base, dotted. becoming purplish toward the apices, veined with deep metallic green; labellum brown-purple, infolded portion with raised dots ; staminode crescent shape. Autumn. China. B. M. 4901. R. H. 1858, p. 182; 1883, p. 353.

4. **callòsum**, Reichb. f. Lvs. ovate-oblong, obscurely tesselated, pale beneath: scapes reddish brown; upper sepal about 3 in. across, unevenly reflexed, slightly concave at base, and translucent ; blush ground color veined with green, upper part white-margined, suffused with rose mauve ; veins carmine-purple toward the apex; petals oblique, recurving, pale green at base, pale rose-mauve at and toward the extremities, upper margin with several blackish warts, ciliate ; labellum dull reddish brown, infolded lobes greenish, with red-brown, shiny warts ; staminodium crescent-shaped. February and March ; also at other seasons. Siam. R. H. 1888: 252.

Var. **Sánderæ**, Hort. An albino form of the species, with no trace of rose-mauve or purple. The fls. are white and delicate green. J. H. III. 28: 423.

5. **Lawrenceànum**, Reichb. f. Lvs. oval-oblong, nearly 1 ft. long, tessellated with yellowish and dark green: scapes tall, reddish brown, sometimes 2-fld.: fls. large; upper sepal orbicular, white, with broad carmine-purple veins, which are greenish at the base; lower sepal small; ovary long, subtended by a small bract; petals purplish at and toward the apices, otherwise greenish, provided with black warts along the margins; labellum dull brown-purple; staminode broadly crescent-shape. April–July. Borneo. B. M. 6432. I. H. 30: 478. F. S. 23: 2372. G.C. III. 21: 291.

The following are forms of *C. Lawrenceanum*: *Abbotiànum*. Fls. large, with deep crimson veins on the upper sepal.— *Atropurpùreum*. A dark form, upper sepal with deeply colored veins.— *Auriculum*.— *Coloràtum*. Veins deep colored, the interspaces suffused.— *Gigantèum*. A variation from the type in the large size of the fls.— *Gránde*.— *Hyeànum*. Upper sepal veined with green; petals green; labellum green. G.C. III. 21: 37.— *Líndeni*.— *Magníficum*.— *Marmoràtum*.—*Nígrum*.— *Píctum*.— *Pitcherìànum*.— *Pleioleùcum*. Upper sepal white, with only a few colored veins.— *Purpuráscens*.— *Ròseum*.— *Supèrbum*.— *Virèscens*.

CC. *Upper sepal veined with green, but slightly if at all veined with crimson ; petals more or less spotted or dotted.*

6. **Árgus**, Reichb. f. (*C. barbàtum*, var. *Argus*, Hort. *C. Pitcherìànum*, Hort.). Lvs. oblong-lanceolate, about 6 in. long, pale green mottled with deeper green: scape long, reddish brown: ovary subtended by a small bract; upper sepal broadly ovate, acuminate, dotted at base, veined with green, the longer veins sometimes purplish: petals oblong, undulate, deflexed, pale green tinged with purple at the apices, irregularly spotted with blackish warts; labellum dull brown-purple, greenish beneath; infolded lobes purplish, spotted with deeper purple; staminode crescent - shaped. March, April. Luzon, Philippines. B.M. 6175. A.F. 3:179.

7. **ciliolàre**, Reichb. f. Lvs. oblong, pale green, tessellated with dark green: scapes tall, reddish brown: ovary subtended by a small bract; upper sepal broadly ovate, acuminate, ciliate on the margins, blush white at base, otherwise white, veined with green; petals ligulate, deflexed, recurved, with long marginal hairs, greenish at base, becoming pale mauve at and toward the extremities, thickly dotted with blackish warts; labellum dull brown-purple; infolded lobes yellowish, with reddish brown warts; staminode reniform. April–July and even later. Philippine Islands. I.H. 31:530. G.C. III. 21:348.

8. **supérbiens**, Reichb.f. (*C. Veitchiànum*, Lem.). Lvs. oval-oblong, about 6 in. in length, yellowish green, mottled with deeper green, pale beneath: scapes tall, greenish: ovary subtended by a small bract; upper sepal broadly ovate, whitish, evenly veined with green; petals deflexed, almost drooping, ligulate, hairy-margined, white, suffused with pale rose, tinged with reddish brown at base, veined with green and copiously dotted with reddish brown; labellum dull brown-purple; infolded lobes brighter, with raised dots; staminode reniform-subrotund, horns straight. June, July. Malay Peninsula. I.H. 12:429. F.S. 19:1996. A.F. 7:707. R. H. 1871, p. 596.

9. **Cúrtisii**, Reichb. f. Lvs. broadly oval oblong or narrowly oblong, pale green tessellated with darker green, pale beneath: scapes about 1 ft. high, reddish brown: ovary subtended by a small bract; upper sepal disproportionately large, broadly ovate, greenish with a white margin, tinged with brown-purple at the base, green veined with brown and green: petals ligulate, deflexed, dull brown-purple or brownish green at the base, veined with green, pale along the median vein, and thickly dotted with red-brown; margins ciliate: labellum large, dull reddish brown, infolded lobes paler, dotted; staminode reniform. May–July. Sumatra. A.F. 6: 557. Gng. 1: 41.— *C. ciliolare* and *C. superbiens* are very closely related.

10. **tonsum**, Reichb. f. Lvs. ovate-oblong, pale green conspicuously maculate with dark green, pale beneath or spotted toward the base: scapes 12 in. or more long, brownish green: ovary pale green, subtended by a small bract ; upper sepal broadly obovate, with wide base, abruptly acuminate, whitish, often with blush rose suffusion; veins green; petals broad, devoid of marginal hairs, oblong ovate or subspatulate, green, median nerve paler green, with a row of large reddish brown spots, other veins brownish, giving a tinge of brown to adjacent tissue ; labellum large, compressed dorsiventrally, brownish; infolded lobes pale yellowish green, with raised pale dots; staminode crescent-shaped, the horns strongly oblique. Autumn. Mountains of Sumatra.

11. **venùstum**, Wall. Lvs. oblong, dull purple beneath, upper surface pale green, marbled with dark green: scapes about 8 in. tall: ovary subtended by a bract which sheaths it for half its length; dorsal sepal ovate, white veined with green; petals green at base, dull purple toward the extremities, provided with several blackish warts; labellum pale green, conspicuously veined with emerald-green, infolded lobes paler ; staminode crescent-shaped. January–March. India. B.M. 2129.

CCC. *Upper sepal distinctly veined with green: spots on the petals, if any, few.*

12. **Dayànum**, Reichb. f. (*C. Pètri*, Reichb. f.). Lvs. oblong, pale green, remotely cross-veined with dark green, pale beneath: scapes reddish brown; upper sepal ovate, acuminate, whitish, veined with green, upper margin recurved: petals brownish green at base, salmon-pink toward the apices, upper margins obscurely spotted, ciliate with dull crimson hairs; labellum roughish, dusty-looking, infolding portion greenish, with dull crimson-brown warts ; staminode oblong. Borneo. May, June. F.S. 15: 1527.

13. **Javánicum**, Reinw. Lvs. oblong, pale, maculate with dark green: scape greenish, 1- or 2-flowered: ovary subtended by a small bract; upper sepal ovate acuminate, greenish white veined with green, lower margin reflexed: petals oblong, greenish, with fine blackish dots, becoming purplish or pale rose color at the apices, ciliate on the margins; labellum darker green than the petals, infolded lobes pale green, but variously dotted; staminode reniform-subrotund. Java.—Var. **virens**, Hort., is smaller, the green color more pronounced.

CCCC. *Upper sepal not distinctly veined with green, but more or less with purple.*

14. **Mastersiànum**, Reichb. f. Lvs. oblong, remotely tessellated: scape tall, brown-purple. ovary subtended by a short bract; upper sepal orbicular, acute, bright green with a greenish white or yellowish border, veined with greenish brown; petals spreading, brownish, paler at and toward the base, and provided with blackish warts on the upper margin and median vein; labellum large, brownish, infolded lobes paler, with dull purple spots ; staminode crescent-shaped, horns converging. Java. G.C. III. 15: 593; 25: 274. B.M. 7629, as a Paphiopedilum.

15. **Hoòkeræ**, Reichb. f. Lvs. variegated dull green and greenish white, pale beneath, ovate oblong: scapes tall, slender: upper sepal rotund, acuminate, green, with

a cream-colored margin; petals subspatulate, purplish at the apices, with a green stripe toward the base; labellum greenish brown, infolded portion greenish, with a few raised warts; staminode oval. Borneo. B.M. 5362.

Var. **Bulleniànum,** Hort. (*C. Bulleniànum*, Reichb. f.). Lvs. not so strikingly mottled: fls. smaller, upper sepal streaked at the base. Borneo.

645. Cypripedium Hookeræ, var. volonteanum (× ⅓).

Var. **volonteànum,** Hort. Fig. 645. Fls. larger than in the type; petals oblong spatulate, green, except at extremities, where they are pale mauve, median portion richly dotted with crimson-brown; labellum greenish brown. June and July, and earlier. Borneo.

16. **Appletoniànum,** Rolfe (*C. Bulleniànum*, var. *Appletoniànum*, Hort.). Lvs. less tessellated than in the preceding; staminodium very small, greenish. This form is sometimes considered as a sub-variety of *C. Bulleniànum*. Borneo.

BB. *Petals and sepals nearly equal: fls. fleshy.*

17. **cóncolor,** Batem. Lvs. oval-oblong, mottled, dull purple beneath: scape short: upper sepal yellow, dotted with purple, similar to the petals; labellum yellow, compressed. Autumn. Burma. B.M. 5513.

18. **níveum,** Reichb. f. Lvs. oval-oblong to oblong, short, mottled: fls. white; petals and upper sepal nearly equal, finely dotted at base with purple, dots variable in number and distribution. Burma. B.M. 5922.

19. **Gódefroyæ,** Leb. Lvs. narrower than in the preceding: scape short: fls. whitish to pale yellow, spotted with purple-magenta; petals deflexed. Early, and as late as July. Cochin China. B.M. 6876. Gn. 25, p. 396.

Var. **leucochìlum,** Hort. Upper sepal white, blotched with deep purple; labellum white; petals like the upper sepal, spots smaller. G.C. III. 15:815. J.H. III. 30:423. F.R. 1:371.

20. **bellátulum,** Reichb. f. Lvs. broad, rounded at apices, slate-green, mottled with darker green, thickly dotted beneath with brownish purple, except in var. *album*, when the lvs. are pale beneath: scapes very short: upper sepal concave, roundish, white, spotted with brown-purple; lower sepal also spotted; petals orbicular, tending to be concave, spotted with large, irregular, brown-purple spots; labellum ovate, finely dotted with brown-purple. Fls. in summer; also at other seasons. Shan States. G.C. III. 21:320. J.H. III. 30:513. A.F. 6:557; 13:77, 622; 14:675. Gng. 7:129.—Var. **álbum,** Hort. Has white fls. devoid of spots: lvs. not brown-purple beneath.

AA. *Lvs. coriaceous, ligulate, not tessellated or only obscurely so.*

B. *Fls. not more than 2, except in vigorous plants.*

C. *Staminodium without a protuberance or horn from its center.*

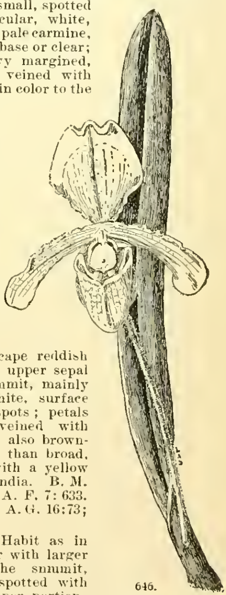
21. **Fairieànum,** Lindl. Upper sepal sub-rotund, whitish, veined with dark carmine-purple; petals oblong, deflexed, recurved at the apices, whitish, veined with green and purple; labellum brownish green, reticulated; staminodium orbicular, with a pronounced beak or tooth from the lower margin, white, with green veins. Habitat unknown, 1857.—The only living records of this species in America are found in several splendid hybrids, such as *C.* × *Niobe*, *C.* × *vexillarium*, *C.* × *Arthurianum*, *C.* × *Amesæ* and *C.* × *H. Ballantine*. There are several plants in English collections. There are no living plants in America. The species is not vigorous enough to be worth the growing.

22. **hirsutissimum,** Lindl. Lvs. ligulate, uniform green: scape greenish: ovary and bracts clothed with shaggy hairs; upper sepal narrow at base, broader toward the summit, nearly ovate, brownish, with a green margin, finely dotted at base; petals green at base, finely dotted, becoming purplish; margin sinuate, undulate; labellum green, finely dotted, downy and ciliate; staminode bluntly quadrate or spade-shaped, with 2 white eyes. March, April and May. Java. B.M. 4990. R.H. 1859, pp. 182–3.—Int. at same time as *C. Fairieanum* (1857).

23. **Spiceriànum,** Reichb. f. Lvs. linear-oblong, dark green: scape about 8 in. long: ovary subtended by a spotted bract; upper sepal white, strongly reflexed so as to have a narrow base and broad, incurved summit, median line carmine-purple; petals short, wavy margined, yellowish green, with conspicuous mid-veins of reddish brown; labellum green or brownish; staminodium white-margined, otherwise pale mauve. Oct.–Dec. Assam. B.M. 6490. I.H. 30:473. Gn. 48, p. 304. A.G. 11:159. A.F. 3:226. Gng. 1:242. F.E. 9:329.—Habitat unknown when first plants were introduced. Many varieties.

CC. *Staminodium provided with a protuberance or horn.*

24. **Chárlesworthii,** Rolfe. Lvs. ligulate, obscurely tessellated, heavily spotted beneath throughout or only at the base: scapes short, spotted like the lvs.: ovary spotted, subtended by a small, spotted bract; upper sepal orbicular, white, mottled and suffused with pale carmine, purple rose, brownish at base or clear; petals short, rarely wavy margined, yellowish or brownish, veined with brown; labellum similar in color to the petals (variable), spreading at the aperture, small in comparison with the upper sepal; staminode shiny, pure white, with an orange-yellow tipped process. Autumn. E. Indies. B.M. 7416. R.B. 20:241. Gn. 47:1009 and p. 425. A.F. 13:430.—A very variable and beautiful species, which should give rise to interesting hybrids.



646. Cypripedium insigne, var. Sanderæ. (× ½.)

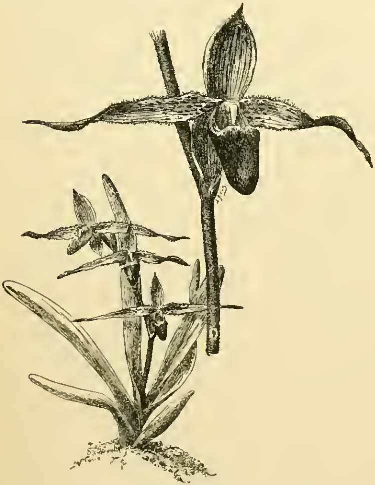
25. **insígne,** Wall. Lvs. linear-ligulate, uniform green, usually finely spotted at the base: scape reddish brown, about 1 ft. high: upper sepal oval, arching at the summit, mainly green, upper margin white, surface covered with brownish spots; petals pale greenish brown, veined with deeper brown; labellum also brownish; staminodium longer than broad, rough and pubescent, with a yellow projection. Autumn. India. B. M. 3412. G. C. III. 18:763. A. F. 7:633. F. E. 9:327. Gng. 1:243. A. G. 16:73; 19:825.

Var. **Chántinii,** Hort. Habit as in type: dorsal sepal larger with larger spots, broad toward the summit, mainly green, heavily spotted with brown, except on the upper portion, where it is white, with several pale mauve spots; labellum colored like the spots, deep polished brown. R. H. 1878:130.

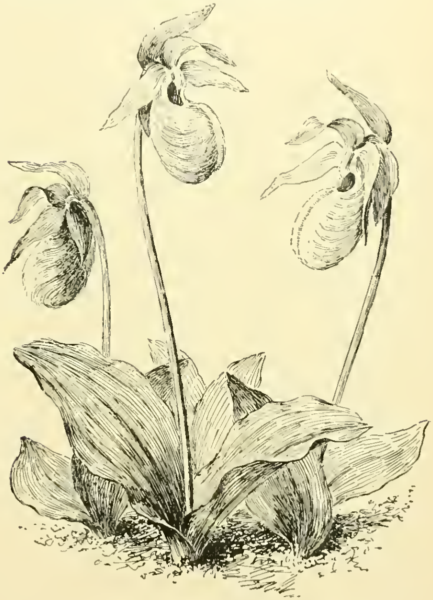
Var. **Érnestii,** Hort., is a yellow form with faint spots on the upper sepal, which lack the characteristic brown and are called "false spots."

Var. **Sánderæ,** Hort. Fig. 646. Foliage pale to the base: scape very pale green: upper sepal white above, otherwise primrose-yellow, with minute reddish brown dots, which vary in number from season to season, and in different fls. on the same plant; petals colored like upper sepal; labellum waxy yellow, spreading at aperture; staminode yellow, with an orange-yellow projection. Gng. 7:196.—The most beautiful Cypripedium.

C. insigne runs into many forms. Following are some of them: *Albo-marginàtum.* Fls. yellowish; upper sepal bordered all round with white; spots light colored, found only on the greenish yellow disk.—*Albens.* Color of fls. soft greenish yellow; upper sepal half white.—*Amesiànum.* Fls. rather large; upper sepal brownish, with a white margin, not spotted, suffused with rich brown.—*Arnoldiànum.* Fls. larger than in var. Maulei; upper sepal with a broad, white margin, spots confined to the greenish yellow disk. G.F.7:425. A.F.6:115.—*Aùreum.* Upper sepal pale yellow; petals and labellum brownish.—*Breevesiànum.* Upper sepal oblong, upper third white, otherwise yellowish green, with regular lines of brown dots; petals reddish brown.—*Bròwnii.* Fls. green; upper sepal heavily blotched or spotted; petals spotted. A.F.7:65.—*Corrugàtum.* Labellum corrugated, otherwise typical.—*Coulsoniànum.* A very large flower, with a broad upper sepal. Closely allied to var. Schrœderianum (?).—*Cowperiànum.* Upper sepal spotted at base, similar to that of var. albo-marginatum; petals rather longer than usual; labellum large.—*Cuttingiànum.* Fls. large, greenish; upper sepal broad, with violet-purple spots on the white.—*Dominiànum.*—*Dormaniànum.*—*Eyermaniànum.* Fls. light yellow, with several light brown spots at base of upper sepal.—*Forstermanni.* Upper sepal with a broad white border; petals distinctly veined with brown.—*Fuscàtum.* R.B.20:25.—*Grácile.* Upper sepal narrow.—*Gilmoreànum.* Fls. rather large; upper sepal spotted with brown.—*Guttàtum.* R.H. 1851:201.—*Horsmaniànum.* Sepals long and narrow.—*Illùstre.* Yellowish variety; sepals and petals spotted.—*Kimballiànum.* Upper sepal flat, reflexed at the summit, yellowish green; spots running in lines into the white border; petals strongly veined.—*Longisèpalum.* Long, narrow sepals; upper sepal brownish below, greenish above, not spotted.—*Lutwycheànum.* Upper sepal somewhat narrower than usual, basal margins wavy; upper margin white, passing to pale yellow; spots hardly visible, same color as the sepal. Belongs to the Ernesti group of varieties.—*Maculàtum.* An obscure variety?—*Mandevilliànum.* Form same as Albo-marginatum. Petals thickly covered with spots in regular lines.—*Maùlei.* White portion of the upper sepal predominating, extending to the base on either side of the green disk; uppermost spots violet-purple, otherwise the spots are larger brownish and few.—*Máximum.* Upper sepal large, deep green.—*Màcfarlanei.* Allied to var. Sanderæ. Sepal and petals narrower, deeper yellow.—*Mooreànum.* Fls. pale yellow; spots large.—*Moulmeinénse.*—*Nílssoni.*—*Nìtens.*—Larger than the type, stronger in growth: fls. very large; upper sepal white-margined; spots in irregular rows.—*Pynaèrti.*—*Schrœderiànum.* Fls. extremely large; upper sepal nearly orbicular, or petals pale greenish yellow; upper sepal margined with white; broadly ovate; basal margins finely dotted; spots largest at the center; petals brown-veined; staminode with a mucro.—*Studbyánum*—*Supérbiens.*—*Sylhetánse.* Large dark spot, somewhat confluent, in lines along the middle of the upper sepal.



647. Cypripedium Rothschildianum (× ¼).



648. Cypripedium acaule (× ⅓).

26. **Exùl,** Rolfe. Lvs. narrower and more rigid than in the preceding species: upper sepal greenish yellow at the base, spotted with brown, upper part white; petals and labellum similar to those of *C. Druryi.* Siam. B.M. 7510.—Considered by some to be a form of *C. insigne.*

27. **Drùryi,** Beddome. Lvs. ligulate, uniform green: scape about 1 ft. high: ovary subtended by a small bract; upper sepal arching at the summit, yellowish with a dark median band; petals ligulate, yellow, with a dark median band; labellum yellowish. May, June. India. I.H. 24:265. A.F. 6:555.

28. **villòsum,** Lindl. Lvs. linear-ligulate, uniform green spotted with brown-purple at the base: scapes copiously long-hairy: ovary subtended by a bract nearly as long as itself: upper sepal narrow at the base, broader above, brownish at the base, otherwise greenish yellow, finely margined with white; petals spatulate, broad at apices, wavy-margined, oblique, with a conspicuous brown midvein, otherwise brownish yellow; labellum brownish yellow; staminode large, oblong, yellowish. Jan., Feb. India. I.H. 4:126. A.F. 6:555.

Var. **Bóxalli,** Hort. (*C. Bóxalli,* Reichb. f.). Upper sepal spotted with blackish spots, which are more or less confluent along the median line. Burma. I.H. 26:345.

29. **Sállieri,** Godef. Petals somewhat resembling those of the above; upper sepal large, broad at and toward the summit, yellowish green, spotted with brown, and provided with a broad white border round the upper half. Supposed natural hybrid between *C. villosum* and *C. insigne.*

BB. *Fls. more than 2.*

C. *Petals spatulate.*

30. **Lòwei,** Lindl. Lvs. ligulate, uniform green: scapes often more than 3 ft. long, arching, bearing several fls.: upper sepal yellowish veined with brownish purple at the base, broadly oval, basal margins revolute; petals fully 3 in. long, deflexed, twisted, spatulate, yellowish, with numerous brown-purple spots at and toward the base, the spoon-shaped extremities dull crimson-purple; labellum brown, infolded lobes paler; staminodium obcordate, with a horn-like projection at base. April, May. Borneo. F.S. 4:375. A.F. 11:1349. R.H. 1857, p. 402; 1883, p. 352; 1885, p. 473.

31. **Haynaldiànum,** Reichb. f. Lvs. ligulate, leathery, uniform green: scapes about 20 in. long, villose, greenish brown, 1–5-fld.: upper sepal oval, lower margins revolute, cream-white above, purplish at the margins, the base yellowish, spotted with reddish brown; petals linear, broad at the extremities, and of a dull purple color, yellowish from the base about half way, with several large, reddish brown spots; labellum green tinged with dull purple; staminodium similar to that of preceding, but narrower. Jan.–May. Philippine Isls. B.M. 6296.

649. Cypripedium pubescens (× ½).

CC. *Petals linear, usually drooping and twisted.*

32. **Párishii,** Reichb. f. Lvs. coriaceous, thick, ligulate: scapes arching, pale green, bearing several fls.: upper sepal yellowish, with green veins, narrowly oval, basal margins reflexed; petals linear, twisted, obliquely pendent, greenish yellow at and toward the base, with several blackish spots and a row of marginal dots; distal ends dull, glossy, brownish purple; labellum dark green, usually tinged with brown-purple; staminodium obcordate, with a tooth at base. Autumn. India. B.M. 5791. Gt. 47:25. I.H. 22:214.—Not a free-blooming species.

33. **Stònei,** Hooker. Lvs. ligulate, uniform green, decidedly coriaceous: scapes long, greenish brown, 3–5-fld.: upper sepal nearly orbicular, white, with 4 crimson-magenta veins or streaks, 2 on each side near the upper margin, suffused behind with crimson; lower sepal narrower, with several streaks, similar in color to those on the upper sepal; petals linear, at first spreading, then drooping, twisted at the extremities, pale yellow at the base, becoming deeper and finally reddish brown at and near the apices, spotted with crimson-brown; labellum calceiform, dull rose on the front, paler beneath, finely veined with deeper rose. Autumn. Borneo. B.M. 5349.—One of the finest in the genus.

34. **Philippinénse,** Reichb. f. (*C. lævigàtum,* Batem.). Lvs. thick, ligulate-oblong, uniform green: scape brownish, bearing from 2–5 fls.: upper sepals whitish, broadly ovate, striped with crimson-magenta; lower sepal striped with green; petals linear, twisted, drooping obliquely, greenish at base, becoming pale brown-purple toward the extremities; labellum small, yellowish; staminodium sub-cordiform. April, May. Philippine Isls., 1864. B.M. 5508. G.F. 3:309.

35. **præstans,** Reichb. f. (*C. glandulíferum,* Blume. *C. Neo-Guineénse,* Hort.). Lvs. coriaceous, deep green: peduncle longer than the lvs.: sepals about equal, broadly ovate, yellowish white, veined with reddish brown; petals with marginal warts, twisted, yellowish green; labellum calceiform, yellowish; staminodium nearly quadrangular, lateral margins inflexed. Aug. New Guinea. I.H. 34:26. R.H. 1896, p. 421.—*C. præstans,* var. *Kimballianum,* Hort., is another form. This is not to be confounded with *C. Kimballianum* (see No. 37).

36. **Sanderiànum,** Reichb. f. Lvs. ligulate, thick, uniform green: scape long, reddish brown, bearing several fls.: upper sepal narrowly ovate, yellowish, striped with brown; petals linear, about 18 in. long, yellowish at the base, marked with reddish brown, the middle part barred with reddish brown and yellow, purplish brown at and toward the blunt apices; labellum brownish. Feb.–May. Habitat known but not revealed: perhaps north Borneo. G.C. III. 19:329. Gt. 43:520.

37. **Rothschildiànum,** Reichb. f. Fig. 647. Lvs. thick: scape reddish brown, bearing several fls.: upper sepal ovate, acute, striped with brownish (almost black) veins, ground color yellowish; petals linear, spreading, oblique, yellowish, striped and spotted with dark brown-purple; labellum slipper-form, brownish, margin pale yellow, whitish beneath; staminode with a projecting beak. Winter months. Borneo. B.M. 7102. G.F. 6:145.—*C. Elliottiànum,* O'Brien, is a variety of the above, or at least very closely allied to it. J.H. III. 32:55. A.F. 6:557; 7:855.—*C. Kimballiànum,* from Borneo, is a natural hybrid of *C. Rothschildianum* × *C. Dayanum:* see A.G. 20:719, Fig. 186.

CCC. *Petals much twisted, not drooping.*

38. **Chamberlainiànum,** O'Brien. Lvs. dark green, ligulate: scape arching, bearing several fls. that open in succession: ovary not conspicuously ribbed; upper sepal pale green, brownish at base, with about 12 veins which, brown at first, terminate green; margin whitish, ciliate, dorsal surface hairy; petals narrow, spreading, reflexed, twisted, green, with lines of numerous red-brown spots, tinged rose-pink near the column; labellum pale rosy mauve, copiously dotted with deeper mauve; infolded lobes pale green: staminodium oval. Sumatra. B.M. 7578, as a Paphiopedilum. R.H. 1892, pp. 104–5. G.F. 5:413.

39. **Victòria-Mariæ,** Rolfe. Similar to the above: labellum dull purple; petals and upper sepal not lined with brown spots. Perhaps only a variety of *C. Chamberlainianum.* Sumatra. B.M. 7573, as a Paphiopedilum.

AAA. *Lvs. membranaceous, plicate.*

B. *Foliage of two lvs. upon the ground, or nearly so.*

40. **acaùle,** Ait. Fig. 648. Lvs. ovate, oblong-oval: scape naked, tall: upper sepal and petals brownish, lanceolate; labellum pink-purple to white (variable),

with a fissure in front; staminodium spatuliform. May and June. Newfoundland to N. C., west to Ind., Mich. and Minn. G.W.F. 11. A.G. 13:514; 14:405. Gng. 4:263. A.F. 11:1049.

BB. *Foliage of two lvs. above the ground.*

41. **élegans**, Reichb. f. Plant about 4 in. high: lvs. opposite, borne on an elongated annual stem: upper sepal narrowly ovate, veined with reddish brown; petals lanceolate, similar in color to the sepals; labellum brownish, corrugated; staminode elliptic. July. Sikkim.—Probably not in cultivation in this country.

42. **Japónicum**, Thunb. Lvs. nearly opposite, roundish, undulately plicate: bract longer than the ovary, fl. terminating the scape: sepals and petals lanceolate, acuminate, greenish, dotted with red; labellum white-pink; staminodium cordate, channeled. April, May. Japan.

BBB. *Foliage of several or many lvs. on the stem.*

C. *Lower sepal divided.*

43. **arietìnum**, R. Brown. Plant about 6 in. high, slender: lvs. lanceolate: fls. small, terminal, solitary; upper sepal ovate-lanceolate, brownish green; petals linear; labellum tapering at the apex, white veined with reddish purple, clothed with white, woolly hairs near the aperture; staminodium nearly round. May. Maine to N. Y., Mich. and Minn., and northward. B.M. 1569. L.B.C. 13:1240. F.S. 20:2095.—Fls. curiously irregular in shape, resembling a ram's head.

44. **Himalàicum**, Rolfe. Plant 8–12 in. high: lvs. 3, elliptic-oblong: upper sepal ovate, brownish, with deeper colored veins; petals narrow, oblong, paler than the upper sepal; labellum purple-brown, many-nerved; staminode heart-shape. July. Bhotan.—Probably not cultivated in this country.

45. **Thibéticum**, King. Lvs. 3, close together on the stem: labellum larger than in the preceding, and not depressed, brown-purple; petals pale brown; staminode oval-cordate, angled at the base. July. Sikkim.—Probably not in cultivation.

CC. *Lower sepal little or not at all divided.*

46. **cándidum**, Muhl. Lvs. oblong-lanceolate: fls. terminal, solitary; sepals broader than the petals, ovate-lanceolate; petals spreading like the sepals, greenish; labellum white, striped inside with purple; staminodium lanceolate. May and June. N. Y., Penn., Minn., Mo. and Ky.

47. **pubéscens**, Willd. Fig. 649. Lvs. oval, acute: petals usually twisted, much narrower than the ovate-lanceolate sepals; labellum pale yellow; staminodium triangular. Same range as No. 49. May and June. B.M. 911, as *C. parviflorum.* A.G. 13:513. Mn. 7:5.

48. **Calceòlus**, Linn. Fls. usually solitary; labellum yellow, slightly compressed, shorter than the lower sepal; sepals and petals deep, rich brown; staminodium triangular. Yorkshire and other northern counties of Eng., Eu. R.H. 1892, p. 392. R.B. 21:210.

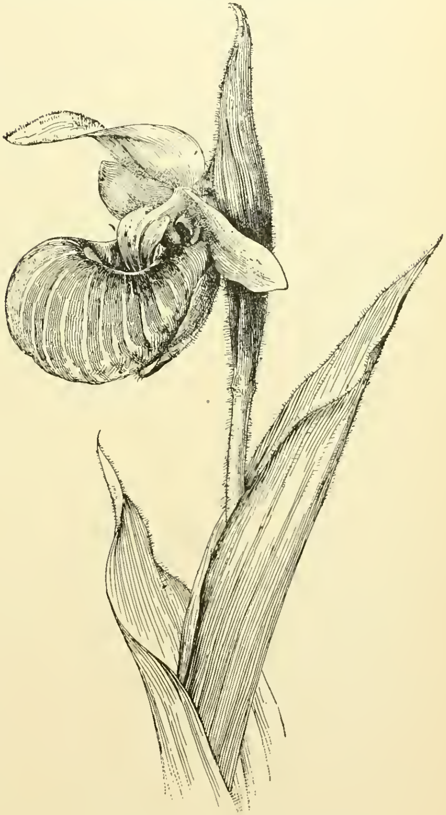
49. **parviflòrum**, Salisb. Lvs. ovate, acute: fls. smaller than in *C. pubescens;* labellum flattened from above and below, not laterally, bright yellow; staminodium triangular. May and June. Newfoundland to Ga., west to Minn. and E. Kans. A.G. 13:515.

50. **spectábile**, Swartz. Fig. 650. Plants stout: lvs. oval, acute: sepals ovate, rather roundish, white; petals oblong, white; labellum white or pale pink-purple; staminodium oval-cordate. June. Maine, western New Eng. to Minn. and Mo., mountains of N. Car. R.H. 1868:410. Gn. 53, p. 77. R.B. 20, p. 198. A.F. 11:1048. Gng. 4:262, 327.

51. **macránthon**, Swartz. Lvs. oblong, acute: fls. purple, not spotted; upper sepal oblong, acute; lower sepal smaller; petals ovate-lanceolate; labellum contracted at the aperture. Moist, shady places, northern Asia, Siberia. R.H. 1877:310.

52. **Califórnicum**, Gray. Plants either slender or stout, varying in height, sometimes exceeding 2 ft.: lvs. ovate-alternate: floral bracts very large, becoming narrowly ovate: fls. small, from 6–12 open at the same time, an inch or more apart on the stem; labellum whitish; sepals oval, yellowish green; petals narrowly oblong, colored like the sepals. Calif. B.M. 7188. G.F. 1:281.

53. **montànum**, Dougl. One to 2 ft., leafy, pubescent: lvs. ovate to broad-lanceolate, 4–6 in. long: fls. 1–3, short-pedicelled, the wavy-twisted petals brownish, the inch-long lip dull white veined with purple; capsule erect or nearly so. Calif. to Wash. B.M. 7319.—Fragrant. Grows in clumps. Handsome.

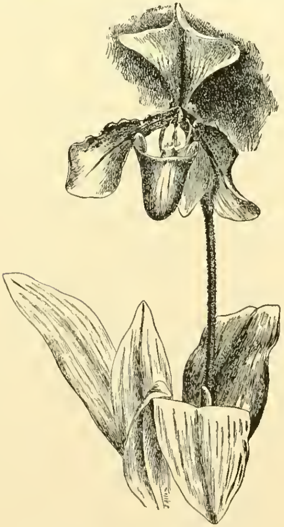


650. Cypripedium spectabile. Natural size.

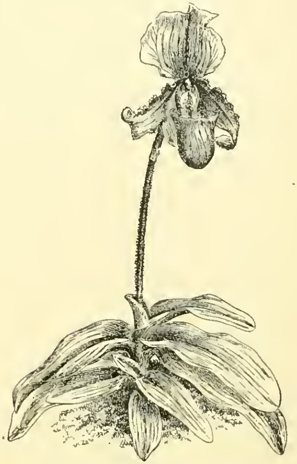
54. **Irapeànum**, Llave et Lex. Lvs. ovate-lanceolate: fls. large, several, sepals and petals about equal; labellum very large, much inflated, suggesting the inflated petal of a Calceolaria. Mex.—This species has not as yet been successfully cultivated.

Supplementary list, comprising hybrid Cypripediums (for catalogues of hybrids, see G.C. III. 17:199 and A.G. 16:118): *Acis* = Lawrenceanum × insigne, var. Maulei.—*Adrastus* = Leeanum × villosum, var. Boxallii.—*Alcides* = insigne × hirsutissimum.—*Alfred Hollington* = ciliolare × Philippinense.—*Allanianum* = Spicerianum × Curtisii.—*Almum* = barbatum × Lawrenceanum.—*Amandum* = insigne × venustum.—*Amesianum* = villosum × venustum (see Measuresianum).—*Apiculatum* = barbatum × villosum, var. Boxallii.—*Artemis* = Dayanum × Swanianum.—*Arthurianum* = insigne × Fairieanum.

A. F. 6:557.—*Arthurianum*, var. *pulchellum*=insigne Chantini × Fairieanum.—*Ashburtoniæ* (C. obscurum)=barbatum × insigne. I.H. 35:61.—*Ashburtoniæ*, var. *expansum* = same.—*Aspasia* = selligerum majus × tonsum.—*Aureum* =nitens, var. Sallierii × Spicerianum. Dist. Icon. des O.—*Auroreum*= Lawrenceanum×venustum.—*Beatrice*=Boxallii × Lowii.—*Berggrenianum*=Dauthierii×insigne.—*Bryonii* (Burfordense)=Philippinense × Argus.—*Buchananianum*=Druryi × Spicerianum.—*Calanthum*=barbatum Crossii×Lowii.—*Caligare*=venustum×Dayanum.—*Callo-Rothschildianum*=callosum× Rothschildianum.—*Calypso.* See Lathamianum.—*Cauhamii* (Chas. Cauham)=villosum×superbiens.—*Carnusianum* =Haynaldianum×Spicerianum.—*Ceres*=Spicerianum×birsutissimum.—*Chelsiense*= Lowii × barbatum, var. Warnerii.—*Chloroneurum*=barbatum×venustum.—*Cleopatra*=œnanthum ×Hookeræ.—*Clinkaberryanum*=Philippinense×Curtisii.—*Clotilde Moens*=Leeanum, var. superbum× Haynaldianum.—*Concinnum*=villosum×purpuratum.—*Conspicuum*=Harrisianum × villosum.—*Constance*=Curtisii × Stonei.—*Cooksonianum*= almum.—*Creon*=Harrisianum, var. superbum × œnantbum, var. superbum.—*Crethus*=Spicerianum×Argus.—*Crossianum* = insigne × venustum.—*Cybele* = Lawrenceauum × Druryi.—*Dauthierii.* See Harrisianum.—*Dibdin*, var. *Davisianum*= villosum, var. Boxallii × Argus, var. Moensii.—*Dilectum*=villosum, var. Boxallii× hirsutissimum.—*Discolor*=venustum× ? —*Donatianum*=insigne, var. Wioti×Harrisianum.—*Doncasterianum*=hirsutissimum×callosum.—*Doris*=venustum×Stonei.—*Drurio-Hookeræ*=Druryi× Hookeræ.—*Electra*=œnanthum, var. electra.—*Enfieldense*=Lawrencearum×Hookeræ.—*Ephialtes* = insigne, var. Chantini × auroreum.—*Euryale* = Lawrenceanum×superbiens.—*Euryandrum*=barbatum×Stonei.—*Eurylochus* = ciliolare × hirsutissimum.—*Excelsior* = Rothschildianum×Harrisianum.—*Fairy Queen*=Curtisii×Druryi.—*Finetianum* = Philippinense, var. Rœbbelenii × barbatum.—*Fitchianum*=Hookeræ× barbatum.—*Frau Ida Brandt*=Io, var. grande×Youngianum.—*Galatea*=Harrisianum × insigne Maulei.—*Gemmiferum* = Hookeræ × purpuratum.—*Germinyanum*, var. *Godseffianum*=villosum, var. Boxallii× hirsutissimum.—*Germinyanum*=villosum × hirsutissimum.—*Gigas*= Harrisianum, var. superbum × Lawrenceanum.—*Gowerianum* = Lawrenceanum × Curtisii.—*Greyanum* = Druryi × ciliolare.—*Harrisianum*=barbatum × villosum. F.S. 22:2289–90. R.B. 22:148. A.F. 6:557.—*Harrisianum*, var. *superbum* = barbatum × villosum.—*Harrisianum*, var. *Dauthierii*= barbatum × villosum.—*H. Ballantine* = purpuratum × Fairieanum.—*Hephæstus* = callosum × ?—*Hobsonii* = Lawrenceanum (pistillate) × Philippense. A.F. 14:1094. Gng. 7:242.—*Hornianum* = Spicerianum × superbiens.—*Hurrellianum* = Argus × Curtisii.—*Hybridum* = villosum × barbatum.—*Ino*=Haynaldianum× Mrs. Cauham.—*Intermedium.* See Hybridum.—*Io* = Lawrenceanum × Argus.—*Javanico-Spicerianum.* See Lutescens.—*Javanico-superbiens.*—*Joseph Donat*= Ashburtonæ × Spicerianum.—*Josephianum* = 'Druryi × Javanico-superbieus. A.F. 7:707.—*Juno*=callosum×Fairieanum.—*Kimballianum*=Rothschildianum × Dayanum.—*Kramerianum*=œnantbum×villosum.—*Krishna*=insigne×tonsum.—*Laforcadei*=barbatum × insigue, var. Chantini.—*Lathamianum* (Fig. 651) = Spicerianum × villosum.—*Lathamianum*, var. *Calypso*=Spicerianum×villosum, var. Boxallii.—*Leeanum* =insigne × Spicerianum.—*Leeanum*, var. *giganteum* = insigne × Spicerianum. A.F. 9:765.—*Leeanum*, var. *Masareelianum*= insigne, var. Chantini × Spicerianum. I.H. 36:77. A.F. 6:555. A.G. 12:65.—*Leeanum*, var. *superbum* is a good form raised by Veitch.—*Loewegrenianum* = Spicerianum × Io grandis.—*Lucidum*=Lowii×villosum.—*Luridum*=Lawrenceanum×villosum, var. superbum.—*Lutescens*=Spicerianum×Javanicum.—*Lynchianum*=Spicerianum × sellegerum.—*Macropterum*= Lowii×superbiens.—*Marmorophyllum*=Hookeræ×barbatum.—*Marshallianum* = venustum, var. pardinum × concolor.—*Masereelianum.* See Leeanum.—*Massaianum*=superciliare × Rothschildianum.—*Maynardi*=purpuratum×Spicerianum.—*Measuresianum* = villosum × venustum.—*Measuresianum*, var. *paroninum*=villosum, var. Boxallii×venustum.—*Morganæ* =superbiens×Stonei. I.H. 34:5.—*Mrs. Cauham*=superbiens× villosum.—*Mrs. G. D. Ower*=superciliare×villosum.—*Mulus* = hirsutissimum× Lawrenceanum.—*Niobe* (Fig. 652)= Spicerianum×Fairieanum.—*Nitens*=villosum×insigne, var. Maulei.—*Nitens*, var. *Sallierii*=insigne×villosum.—*Nitens*, var. *Sallierii*, sub-var. *Hyeanum*=insigne×villosum.—*Nitens*, var. *Schlesingerianum*=villosum, var. Boxallii×insigne.—*Nitens*, var. *Mons de Curte*=Boxallii × insigne Chantini.—*Numa*=Lawrenceanum× Stonei.—*Oakes Ames*=ciliolare×Rothschildianum.—*Obscurum* =œnantbum.—*Œnanthum*=Harrisianum×insigne.—*Olivia*= tonsum × niveum.—*Orestes* = œnanthum, var. Orestes.—*Orphanum*=barbatum × Druryi.—*Osbornei* = Harrisianum, var. superbum×Spicerianum.—*Pageanum*=superbiens×Hookeræ.—*Pallens* = Spicerianum × Dayanum.—*Patersonii* = Lowii × Lawrenceanum.—*Pavoninum.* See Measureianum. A.F. 7:707.—*Pelias*=Haynaldianum×insigne.—*Pelops*=Niobe×javanico-superbiens.—*Pellucidum*=insigne, var. Maulei × Dayanum.—*Picturatum*=Spicerianum×superbiens.—*Pitcherianum*=Harrisianum, var. superbum×Spicerianum.—*Pleistochlorum*=barbatum × javanicum, var. virens.—*Pleuroneuron* = venustum× villosum.—*Plunerum* = villosum × venustum (?).—*Politum* = barbatum × venustum.—*Pollettianum* = calophyllum × œnanthum, var. superbum.—*Prewettii* = Harrisianum×villosum.—*Radiosum*=Lawrenceanum×Spicerianum.—*Regale*=insigue, var. Maulei×purpuratum.—*Rowallianum*=villosum×venustum (see Measureiaum).—*Rubescens* = œnanthum, var. superbum×villosum, var. Boxallii.—*Savageanum*=Harrisianum × Spicerianum.—*Selligerum*=barbatum × Philippense.—*Sel-*



651. **Cypripedium Lathamianum** (× 1/3). Hybrid. (See supplementary list.)



652. **Cypripedium Niobe** (× 1/3). Hybrid. (See supplementary list.)

ligerum, var. *majus* = barbatum × Philippinense. A.F. 11:1349. — *Seegerianum* = Harrisianum × Spicerianum. — *Superciliare* = barbatum × superbiens. — *Susan Ames* = Leeanum × nitens. — *Svend-Brunn* = Lowei × Curtisii. — *Swanianum* = Dayanum × barbatum. — *Swinburnei* = insigne, var. Maulei × Argus. — *T. B. Haywood* = Druryi × superbiens. — *Tesselatum* = concolor × barbatum. A.F. 7:707. — *Thayerianum* = Lawrenceanum × villosum, var. Boxallii. — *Thibautianum* = Harrisianum × insigne, var. Maulei. — *Thorntonii* = superbiens × insigne. — *Thorntonii*, var. *Blombergii* = insigne × superbiens. — *Titÿns* = Spicerianum × œnanthum, var. superbum. — *Tonso-villosum* = tonsum × villosum. — *Turpe* = barbatum × Argus. — *T. W. Bond* = hirsutissimum × Swanianum. — *Umlauftianum* = insigne, var. Chantini × Lawrenceanum. — *Van Houteanum* = niveum × Dauthieri. A.F. 6:557. — *Vernixum* = Argus × villosum. — *Vexillarium* = barbatum × Fairieanum. — *Wallœrtianum* = Harrisianum × villosum. — *Wiganianum* = Harrisianum or Hookeræ × Ashburtonæ. — *Williamsianum* = Harrisianum × venustum or villosum.

C. débile, Reichb. f., a small Japanese species, is offered by importers of Japanese plants. It is the *C. cardiophyllum*, Franch. & Sav. Fls. very small, not much larger than those of *Calypso borealis*. — *C. fasciculatum* is offered by importers of Dutch bulbs. The *C. fasciculatum*, Kellogg, is Californian: 2–6 in., bearing a pair of nearly opposite, ovate, somewhat acute lvs.: fls. solitary or several, greenish, the depressed lip greenish yellow with a purplish margin.

OAKES AMES.

CYRÍLLA (after Dominico Cyrillo, professor of medicine at Naples, 1734–1799). *Cyrillàceæ.* Shrub, rarely tree: lvs. short-petioled, entire, glabrous, deciduous or nearly persistent: fls. small, white, in narrow slender racemes, 5-merous: fr. a small indehiscent 2-celled capsule with 2 seeds. Probably one variable species from N. Carolina to Florida, west to Texas, and in W. India and S. America. Ornamental shrub, rarely cultivated, with handsome bright green foliage, and graceful racemes of white fls., hardy north to New York. Thrives best in humid sandy soil and shady position. Prop. by seeds and cuttings under glass, with slight bottom heat.

racemiflòra, Linn. LEATHERWOOD. Shrub, occasionally tree to 30 ft.: lvs. cuneate, oblong or oblanceolate, usually obtuse, reticulate-veined, 2–3 in. long, bright green, turning orange and scarlet in fall, but in tropical climates evergreen: racemes 4–6 in. long, erect, at length nodding. B.M. 2456. S.S. 2:51. —The variety from W. India has been described as *C. Antillana*, Michx., and that of Brazil as *C. racemifera*, Vandelli.

ALFRED REHDER.

CYRTÁNTHUS (Greek, *curved flowers;* from their pendulous habit). *Amaryllidàceæ.* Twenty species of tender bulbs from South Africa, known only in a few American greenhouses. Their culture is presumably like that of many other bulbs from the same region. They are suitable for pot culture, or for planting out in summer. The following analytical key gives an idea of the group, and its three subgenera.

A. *Fls. many in an umbel, pendulous.*

B. *Lvs. strap-shaped. (Cyrtanthus proper.)*

obliquus, Ait. Bulb ovoid, 3–4 in. thick: lvs. 10–12, strap-shaped, distichous, produced after the fls., 1½–2 ft. long: scape 1–2 ft. long, stout, mottled: fls. 10–12 in an umbel, entirely drooping, odorless, bright red, with more or less yellow, and greenish tips 2–3 in. long; pedicels ½–1 in. long; style not exserted. Cape Colony. B.M. 1133.

BB. *Lvs. linear. (Monella.)*

Máckenii, Hook. f. Bulb 1½ in. thick: lvs. 2–6, appearing with the fls., linear, 1 ft. long: scape slender, slightly glaucous: fls. 4–10 in an umbel, pure white, 2 in. long; style exserted. Natal. G.C. I. 29:641. Gn. 50, p. 63.

AA. *Fls. single, or few in an umbel, erect or slightly curved downward. (Gastronema.)*

sanguíneus, Hook. Bulb 2 in. thick: lvs. 3–4, appearing with the fls., lanceolate, petioled, 1 ft. long: scape slender, 6–9 in. long: fls. 1–3, bright red, 3–4½ in. long, wider funnel-shaped than in the two preceding species, with a throat 1 in. across. Caffraria, Natal. B.M. 5218.

C. Húttoni, Baker, belongs to Cyrtanthus proper, but its lvs. appear with the fls., and it has 6–8 or even 12 pale red fls. about 1 in. long, and a much shorter style than in *C. obliquus*. Cape Colony. B.M. 7488. Gn. 50:1076.

W. M.

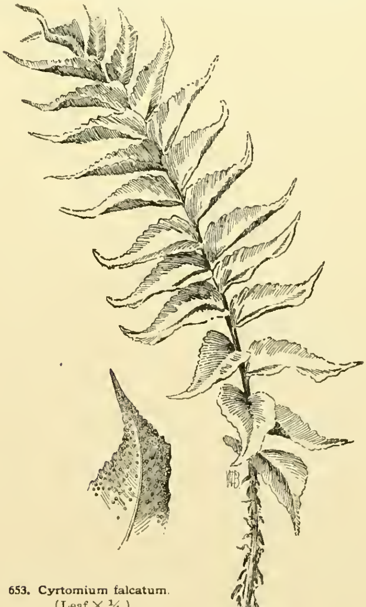
CYRTOCÁRPA (Greek, *curved fruit*). *Anacardiàceæ.* Two Mexican trees, of which one bears a small fruit, likened to a cherry by the natives of Lower Calif. Introduced into S. Calif. by F. Franceschi. Santa Barbara.

pròcera, HBK. Very tall tree, with slender, terete, dark purplish, resinous branches: lvs. alternate, odd-pinnate: leaflets 5–7 or 9, oblong, entire, with a very slight silkiness, especially below, very shortly stalked, 1 in. or more long, half as wide: fls. white, inconspicuous, in panicles 1–2 in. long; calyx 5-parted, villous, persistent; segments roundish; petals 5, elliptic; stamens 10; style 1: fr. the size of an olive, edible. Mex. HBK. 6, t. 609.

CYRTOCHÌLUM. Referred to *Oncidium.*

CYRTODÈIRA. See *Episcia.*

CYRTÒMIUM (Greek, *a bow*). *Polypodiàceæ.* A genus of Asiatic half-hardy or greenhouse ferns of rigid habit, with simply pinnate lvs., anastomosing veins and firm indusia fixed by the depressed center. Culture as for Polystichum, to which it is closely allied.



653. Cyrtomium falcatum.
(Leaf × ¼.)

A. *Margins of pinnæ entire or slightly undulate.*

falcàtum, J. Sm. Fig. 653. Pinnæ ovate, falcate; the lower rounded or obliquely truncate at the base, 4–6 in. long, 1–2 in. wide. Japan and India. — The large thick, glossy foliage makes it an excellent fern for decorations.

Fòrtunei, J. Sm. Pinnæ lanceolate, opaque, 2–4 in. long, ½–1 in. wide. Japan.

B. *Margins of pinnæ toothed or sometimes lobed.*

caryotídeum, J. Sm. Pinnæ larger, 5–7 in. long, 1½–2½ wide, often auricled on both sides at the base, sharply toothed. India.

L. M. UNDERWOOD.

CYRTOPÈRA. Consult *Cyrtopodium Woodfordii.*

CYRTOPÒDIUM (Greek for *curved foot*, from the shape of the lip). *Orchidàceæ*, tribe *Vàndeæ*. Epiphytes: stems fusiform, bearing plicate leaves: sepals and petals equal, free; column semiterete: pollinia 2, caudicle short, gland ovate: scapes radical, bearing numerous flowers, pure yellow or spotted with crimson. Probably two dozen species, widely distributed in the tropics. They are large-growing plants, with large and showy flowers. They need a rich, fibrous soil with manure. Grow in a warm or tropical house.

Ándersonii, R. Br. Stems 5 ft. high: lvs. long, lanceolate, sheathing at the base: scape often 3 ft. high, branching, bearing many yellow flowers: sepals and petals broad, bright yellow, the labellum brighter, front lobe slightly concave. Specimens with over 100 fls. have been recorded. Tropical Amer. B.M. 1800.

punctàtum, Lindl. Habit as above: scape from 2–3 ft. high, branching about midway, dotted with dull purple, the branches subtended by membranaceous sheathing bracts, which are lanceolate, undulating, and dotted with crimson: sepals oblong-lanceolate, undulate, greenish yellow blotched with crimson; petals similar, spotted at the base; labellum ½ in. long, fleshy, bright yellow, lateral lobes crimson, midlobe spotted and margined with crimson; column green. Extensively distributed through S. Amer. B.M. 3507. F.S. 22: 2352.—Var. **Saintlegeriànum,** Hort. (*C. Saintlegeriànum,* Reich. f.). Has brighter markings on the bracts and flowers.

Woòdfordii, Sims (*Cyrtopèra Woòdfordii,* Lindl.). Stems fusiform: lvs. lanceolate: scape radical, bearing a many-flowered raceme: fls. greenish, with a purple labellum; sepals linear lanceolate; petals oblong. Trinidad, Martinique. B.M. 1814.

Oakes Ames.

CYRTOSPÈRMA (Greek, *curved seed*). *Aroìdeæ.* This genus includes a handsome warmhouse tuberous foliage plant, with large, hastate red-veined leaves, resembling an Alocasia, but easily distinguished by its spiny stems. It was introduced into cult. in 1880 from the Solomon Islands as *Alocasia Jóhnstoni*, but two years later it flowered, and it became evident that the plant was a Cyrtosperma. This plant was once advertised by Pitcher & Manda as Cyrtemeria, apparently a typographical error, as there is no such genus. Cyrtosperma has 9 species, remarkably scattered in the tropics. They are herbs with tubers or long rhizomes: leaf and flower-stalks often spiny or warty: lvs. hastate or sagittate; petioles long, sheathing at the base. Culture presumably same as Alocasia.

Jóhnstoni, N. E. Br. (*Alocàsia Jóhnstoni,* Hort.). Tuberous: petiole 2–2¾ ft. long, olive green, spotted rose, covered with fleshy, spine-like warts: lvs. sagittate, depressed in the middle, 1½–2 ft. long, olive-green, with prominent and beautiful red veins above. I.H. 27:395.

C. fèrox, Lind. & N. E. Br., is a second species of this genus, figured in I.H. 39:153, but not known to be in the Amer. trade. It has narrow-sagittate lvs. on slender, very prickly petioles: spathe rather large, reflexed, greenish white. Borneo.

CYRTÓSTACHYS (Greek for *arched spike*). *Palmàceæ*, tribe *Arèceæ*. Three Malayan, spineless, pinnate-leaved palms, sometimes seen in choice collections. They thrive on the treatment given to Areca and Chrysalidocarpus. Spadix large, branching and pendent: fls. monœcious, the two kinds in one spadix—each pistillate accompanied by two staminates with 6 stamens. Two species are offered in this country:

Rénda, Blume. Height 25–30 ft.: leaflets linear or ensiform, obtuse, unequally 2-toothed, delicate gray beneath, the petioles dark, brownish red.

Lákka, Becc. Petioles green: lvs. broad, boldly arched, the leaflets unequally 2-toothed.

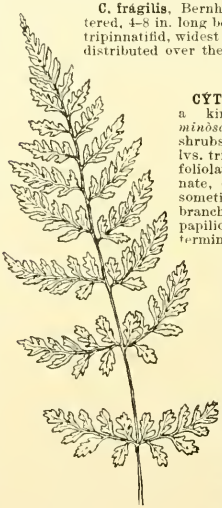
CYSTACÀNTHUS (Greek for *bladder Acanthus*, because the flowers are inflated). *Acanthàceæ*. Five erect, evergreen herbs of Burma and Cochin China, with showy, sessile fls. in the axils of bracts, the entire inflorescence more or less crowded into a terminal panicle or thyrse. Corolla-limb spreading, unequally 5-lobed, the lobes short-rotund: stamens 2: style filiform, the stigma 2-toothed: lvs. entire. One species is cult. in the Old World, but is not known to be in the Amer. trade. This is *C. túrgida*, Nicholson, B.M. 6043 as *Menínia túrgida*, Fua. It comes from Cochin China; 2 ft. or less high, with prominently jointed stems and opposite, elliptic-lanceolate lvs.: fls. white, yellow in the throat and pink-reticulated on the lobes. Cult. as other warmhouse Acanthads. (See *Aphelandra* for example.) Prop. by cuttings of young wood.

CYSTÓPTERIS (Greek, *bladder-fern*). *Polypodiàceæ*. A small genus of hardy native ferns, with delicate foliage, and round sori, covered by a delicate indusium which is attached under one side and opens at the other, becoming hood-like in appearance and finally disappearing. The 5 species all grow in the north temperate zone. Of easy culture in shady, rich borders.

C. bulbifera, Bernh. Lvs. 8–24 in. long, widest at the base, tripinnatifid, bearing on the under surface of the rachis a series of bulb-like bodies, which germinate and propagate new plants. Thrives best on lime-bearing rocks. Canada to North Carolina.

C. frágilis, Bernh. Fig. 654. Lvs. clustered, 4–8 in. long besides the slender stalks, tripinnatifid, widest above the base. Widely distributed over the world at all altitudes.

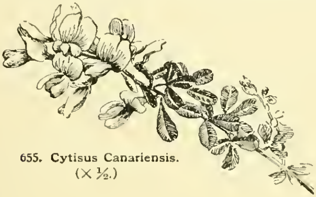
L. M. Underwood.



654. Cystopteris fragilis. (× ⅓.)

CÝTISUS (Greek name for a kind of clover). *Leguminòsæ.* Broom. Mostly low shrubs, rarely small trees: lvs. trifoliolate, sometimes unifoliolate, rather small, alternate, deciduous or persistent, sometimes few and minute and branches almost leafless: fls. papilionaceous, axillary or in terminal heads or racemes, yellow, white or purple; stamens 10, connate; style curved: pod flat, dehiscent, with few or many seeds; seeds with a callose appendage at the base. About 45 species in S. and M. Europe, Canary Isl., N. Africa and W. Asia. Ornamental free-flowering shrubs, blooming most in early spring and summer. Nearly hardy north are *C. hirsutus, C. capitatus, C. scoparius, C. nigricans, C. leucanthus,* while the evergreen species *C. Canariensis, C. candicans, C. filipes* are hardy only south. Most of the species are well adapted for borders of shrubberies, and thrive in almost any well drained soil and in sunny position; they naturalize themselves often very quickly in dry, gravelly soil, where few other plants will grow; *C. scoparius* especially does so. The Cytisus ought to be transplanted carefully and when young, as they do not bear transplanting well as older plants. Some dwarf species like *C. Ardoini, Kewensis, glabrescens, purpureus* and *leucanthus* are very handsome for rockeries. The evergreen *C. Canariensis* and *racemosus* are much grown in the north as greenhouse shrubs, blooming profusely in early spring; also the white-flowering *C. albus* and *filipes* make handsome pot-plants, and may be had in bloom in February with gentle forcing. For pot-plants, a light sandy loam with peat added forms a suitable compost. After flowering the plants should be cut back and repotted as soon as they start into new growth.

After repotting they are kept close and often syringed until they are established; then they ought to have plenty of air and only slight shade. When the new growth has been finished they may be put in the open air until frost is threatening. During the winter they should be kept in a cool greenhouse with plenty of light and carefully and moderately watered. From January they may be transferred gradually in a warmer house for forcing.


655. Cytisus Canariensis. (× ½.)

Cuttings started in early spring, transplanted several times and then gradually hardened off, can be grown into flowering specimens for the following spring. Prop. by seeds sown in spring and by greenwood cuttings under glass; they are also sometimes increased by layers or by grafting. As stock *C. nigricans* is much used, or *Laburnum vulgare* for small standard trees; for plants grown in the greenhouse or south, *C. Canariensis* is a good stock. ALFRED REHDER.

Of Cytisus, the young growths root readily in December and January in the ordinary way. They should be shifted on as they grow. Good sized plants can be produced if shifting and pinching is not neglected. By the following winter, the winter-propagated plants should be in 5-in. pots, in which size they are most useful. Keep very cool during winter and withhold any forcing. They flower in March, or, if kept at a night temperature of 45°, as late as April. Syringe at all times to prevent red spider. To produce good sized plants in one year, it is best to keep them plunged on a bench under the glass the entire summer, with little shade. Older plants can be plunged out of doors during July, August and September. WILLIAM SCOTT.

Index: albus, 2; Andreanus, 1; atropurpureus, 5; Canariensis, 10; candicans, 8; capitatus, 7; carneus, 5; elongatus, 14, and suppl. list; Everestianus, 11; falcatus, 6; filipes, 3; hirsutus, 6; incarnatus, 2; Linkii, 2; linifolius, 13; Maderensis, 9; nigricans, 14; Palmensis, 3; pendulus, 5; proliferus, 4; purpureus, 5; racemosus, 11, 12; ramosissimus, 10; Schipkænsis (which is offered in the trade as this page goes to press) will be found in the supplementary list under *C. leucanthus;* scoparius, 1; stenopetalus, 12. See *Laburnum* and *Adenocarpus.*

A. *Fls. lateral along the branches.*

B. *Style very long, spirally incurved at the apex: fls. large, yellow or partly crimson.*

1. **scopàrius,** Link. (*Sarothámnus scopàrius,* Wimm. *Spártium scopàrium,* Linn.). SCOTCH BROOM. Shrub, to 10 ft., with erect, slender branches: lvs. short-petioled, 1–3-foliolate; lfts. obovate or oblanceolate, sparingly appressed-pubescent, ¼–½ in. long: fls. usually solitary, ¾ in. long; calyx and pedicels nearly glabrous: pod brownish black, glabrous, villous only at the margin. May, June. M. and S. Europe.—Var. **Andreànus,** Dipp. (*Genista Andreàna,* Puissant). Fls. yellow with dark crimson wings. R.H. 1886:373. Gt. 40:1342. R.B. 19: 129. J.H. III. 32:462. There are also varieties with double and with yellowish white fls. and a form with pendulous branches. All the vars. are more tender than the type.—The Scotch Broom, *C. scoparius,* has become established in this country, as a naturalized plant, in waste places from Nova Scotia to Virginia; and it is also reported from Vancouver Island. It is also recommended by landscape gardeners for covering raw and broken places. Its yellow fls. and nearly bare stems make a unique combination in the American landscape. Even when it kills to the ground in winter, it throws up its stems again in the spring.

BB. *Style not or not much longer than the keel, slightly curved.*

C. *Color of fls. white or purple.*

D. *Calyx short campanulate, not longer than wide: foliage scarce.*

2. **álbus,** Link. (*C. Línkii,* Janka. *Genísta álba,* Lam.). Shrub, to 3 ft., with slender, erect, grooved branches: lvs. short-petioled, 1- to 3-foliolate; lfts. obovate-oblong to linear-oblong, ¼–½ in. long, sparingly appressed-pubescent: fls. axillary, 1–3, white, ⅓–½ in. long: pod appressed-pubescent, usually 2-seeded. May, June. Spain, N. Africa.—Var. **incarnàtus,** Dipp. Fls. white, slightly blushed. L.B.C. 11:1052 as a Spartina.

3. **fílipes,** Webb (*Spartocýtisus fílipes,* Webb). Shrub, with slender, angulate, thread-like branches: lvs. slender-petioled, 3-foliolate, nearly glabrous; lfts. linear-lanceolate: fls. axillary, 1–2, fragrant, pure white; wings much longer than the keel. Feb.–May. Teneriffa.—As *C. Palmensis,* Hort., in the Amer. trade.

DD. *Caylx tubular, longer than wide: lvs. always 3-foliolate: branches terete.*

4. **proliferus,** Linn. Shrub, to 12 ft., with long and slender pubescent branches: lfts. oblanceolate, silky pubescent beneath, green and sparsely pubescent above, 1–1¾ in. long: fls. white, 3–8 on rather long tomentose pedicels; calyx tomentose; standard pubescent outside; pod densely tomentose-villous, 1½–2 in. long. May, June. Canary Isl. B.R. 2:121. L.B.C. 8:761.—Recommended as a fodder plant for California.

5. **purpùreus,** Scop. Procumbent or erect shrub, to 2 ft., quite glabrous: lvs. rather long petioled; lfts. oval or obovate, dark green above, ½–1 in. long: fls. 1–3, purple; calyx reddish: pod black, 1–1½ in. long. May, June. S. Austria, N. Italy. B.M. 1176. L.B.C. 9:892.—Var. **álbus,** Hort. Fls. white. Var. **cárneus,** Hort. Fls. light pink. Var. **atropurpùreus,** Hort. Fls. dark purple. Var. **péndulus,** with slender, pendulous branches, is sometimes grafted high on Laburnum.

CC. *Color of fls. yellow.*

6. **hirsùtus,** Linn. Shrub, to 3 ft., with erect or procumbent, villous, terete branches: lfts. obovate or obovate-oblong, villous pubescent beneath, ½–¾ in. long: fls. 2–3, short-petioled; calyx villous pubescent: pod 1 in. long, villous. May, June. M. and S. Europe, Orient. B. M. 6819 (leaflets erroneously shown as serrate). L. B. C. 6:520 (as *C. falcatus*) B. R. 14:1191 (as *C. multiflorus*).

AA. *Fls. in terminal heads, with bracts at the base.*

7. **capitàtus,** Scop. Shrub, to 3 ft., with erect, terete, villous branches: lfts. obovate or oblong-obovate, sparingly appressed pubescent above, villous pubescent beneath, ¾–1 in. long: fls. yellow, brownish when fading, nearly 1 in. long: pod villous, 1–1½ in. long. July, Aug. M. and S. Europe. L. B.C. 5:497. I.H. Ill. 31:161 (as *Genista*).

656. Cytisus racemosus. (× ½.)

AAA. *Fls. in terminal racemes.*

B. *Foliage persistent: branches grooved or striped*

C. *Lvs. distinctly petioled.*

D. *Racemes rather short and dense.*

8. **cándicans,** Linn. Shrub, to 10 ft.: branches villous-pubescent when young: lvs. short-petioled, usually gla-

brous above, pubescent beneath; lfts. obovate or obovate-oblong, mucronulate, ⅓–¾ in. long: racemes 3–9-fld., short, leafy at the base: fls. fragrant, bright yellow: pod rufous-villous, slightly torulose. May, June. Mediterranean region, Canary Isl.

9. **Maderénsis**, Voss (*Genísta Maderénsis*, Webb). Large shrub or small tree, to 20 ft., closely allied to *C. candicans* and chiefly distinguished by the rufous woolly tomentum covering the young branches, petioles and pedicels, and by the longer petioles. Lvs. crowded; lfts. obovate, acute or mucronulate, often almost glabrous above, scabby beneath, ¼–½ in. long, about as long as petioles: racemes 6–12-fld., short: fls. bright yellow, slightly fragrant: pod 5–7-seeded. May, June. Madeira.

10. **Canariénsis**, Linn. GENISTA of florists. Fig. 655. Much-branched shrub, to 6 ft., with villous-pubescent branches: petioles at least half as long as the lfts.; lfts. cuneate, obovate or oblong-obovate, pubescent on both sides, ¼–½ in. long: racemes usually many-fld., secund: fls. fragrant, bright yellow. May–July. Canary Isl. A.F. 6:802.—Var. **ramosissimus**, Rehder (*C. ramosissimus*, Poir. *C. Attleyanus*, Hort.). Lfts. very small: racemes short, but numerous. L.B.C. 13:1201. B.R. 3:217.

DD. *Racemes elongated.*

11. **racemòsus**, Nichols., not Marn. Fig. 656. Shrub, to 6 ft.: branches pubescent: lvs. rather long petioled; lfts. oblong-obovate, mucronulate, ⅓–¾ in. long, silky pubescent on both sides: racemes elongated, many-fld., secund and rather loose, 3–5 in. long. Probably of garden origin and hybrid between *C. Canariensis* and *C. stenopetalus*. A.F. 6:802; 13:1136.—Better florists' plant than the last. Var. **Everestiànus**, Hort. Fls. of a deeper shade of yellow, very free-flowering. R.H. 1873:390.

12. **stenopétalus**, Voss (*C. racemòsus*, Marn.). Shrub, to 6 ft., with silky pubescent branches: lvs. slender petioled; lfts. cuneate, oblong or narrow-oblong, obtuse, silky pubescent on both sides, ½–1½ in. long: racemes many-fld., loose: fls. large, bright yellow. May, June. Canary Isl. B.R. 26:23 (as *Genista bracteolàta*).—Sometimes cultivated as *C. splendens*, but less desirable as a greenhouse plant than the two former.

CC. *Lvs. nearly sessile.*

13. **linifòlius**, Lam. Shrub, to 3 ft., with erect, appressed-silky tomentose branches: lfts. linear or linear-lanceolate, acute, revolute at the margin, nearly glabrous and shining above, silvery pubescent beneath, ½–1 in. long: racemes short and compact: fls. bright yellow: pod torulose. April–June. Spain, N. Afr., Canary Isl. B.M. 442.

BB. *Foliage deciduous: branches quite terete.*

14. **nigricans**, Linn. Shrub, 2–4 ft., with erect, appressed-pubescent branches: lvs. long petioled; lfts. obovate or oblong-obovate, glabrous above, appressed-pubescent beneath, ⅓–1 in. long: racemes very long and slender, 3–8 in. long. June, July. Germany, N. Italy, Hungary. L.B.C. 6:570. B.R. 10:802. Var. **elongàtus**, Borkh. Blooming again in fall at the top of the elongated fruiting racemes. R.H. 1891, p. 149 (as var. *Carlieri*).

C. Adami, Poir.=Laburnum Adami.—*C. álbus*, Hacqu.=C. leucanthus.—*C. alpìnus*, Mill.=Laburnum alpinum.—*C. Ardòini*, Fourn. Prostrate shrub, to 1 ft. high: lvs. trifoliate, silky: fls 1–6, axillary, yellow; calyx campanulate. Apr., May. Southeastern France.—*C. Austrìacus*, Linn. Allied to C. capitatus. Lfts. narrow, oblanceolate, silky pubescent on both sides: fls. yellow; calyx densely villous. Southeastern Eu., Caucasus.—*C. biflòrus*, L'Herit.=C. Ratisbonensis.—*C. Cantabricus*, Willd. Allied to C. scoparius, but prostrate, with silky lvs. and large bright yellow fls.: pod villous. May. Spain.—*C. Cantábricus*, Hort.=C. scoparius, var. pendulus.—*C. congéstus*, Voss (Teline congesta, Webb). Allied to C. Canariensis. Densely villous-tomentose, small-leaved: racemes short. Teneriffa.—*C. decùmbens*, Walp. Prostrate: lvs. simple, oblanceolate, loosely villous: fls. yellow, axillary, 1–2. S. Eu. L.B.C. 8:718.—*C. elongàto-purpùreus*, Hort.=C. versicolor.—*C. elongàtus*, Waldst. & Kit.=C. Ratisbonensis, var. elongatus.—*C. elongàtus*, Hort.=C. hirsutus.—*C. fràgrans*, Lam. Allied to C. filipes. Petioles short: lfts. densely pubescent: fls. fragrant, white. Spring. Teneriffa.—*C. glabréscens*, Sartor. Procumbent, sparingly appressed-pubescent: lvs. 3-foliolate: fls. lateral, yellow: pod glabrous. N. Italy.—*C. Kewénsis*, Bean (C. albus × Ardoini). Prostrate: lvs. 3-foliolate, pubescent: fls. creamy white. Originated at Kew.—*C. Labúrnum*, Linn.=Laburnum vulgare.—*C. leucanthus*, Waldst. & Kit. Allied to C. capitatus. Lfts. nearly glabrous above, acute: fls. white or yellowish white. June, July. Southeastern Eu. Var. Schipkænsis, Dipp. Dwarf: fls. pure white. Balkan.—*C. nubigènus*, Link=C. fragrans.—*C. præcox*, Hort. (C. albus × purgans). Shrub, to 3 ft., with erect branches: lvs. 1–3-foliolate: fls. yellowish white. Of garden origin.—*C. polýtrichus*, Bieb.=C. hirsutus.—*C. pùrgans*, Willd. Shrub, to 3 ft., appressed-pubescent: branches striped: lvs. 1–3-foliolate, oblong or linear-lanceolate: fls. axillary, yellow, fragrant: pod glabrous. May–July. Spain, S. France.—*C. ramentàceus*, Sieb.=Petteria ramentacea.—*C. Ratisbonénsis*, Schaeff. Allied to C. hirsutus. To 3 ft.: branches slender, appressed-pubescent: lfts. glabrous above, silky beneath: fls. 1–2, yellow; calyx with appressed, yellowish, silky hairs. April–June. M. Eu., W. Asia. Var. elongatus, Koch. More erect: fls. larger, 3–5; calyx with somewhat spreading hairs. B.R. 4:308 (as C. biflorus).—*C. Ruthénicus*, Hort., not Fisch.=C. hirsutus.—*C. sessilifòlius*, Linn. Allied to C. nigricans. Quite glabrous: lvs. nearly sessile, with roundish-obovate lfts.: racemes short, 4–11-fld. May, June. S. Eu. B.M. 255.—*C. triflòrus*, L'Herit. Similar to C. hirsutus. Fls. long-pedicelled, yellow; calyx tube short, not tubular. April, May. S. Eu., N. Afr. Tender.—*C. versícolor*, Dipp. (C. hirsutus × purpureus). Low shrub, with sparingly villous lvs.: fls. yellowish white and pale purple. Sometimes cult. as C. incarnatus.—*C. Wéldeni*, Vis.=Petteria ramentacea.

ALFRED REHDER.

D

DABŒCIA (after its Irish name St. Dabeoc's Heath). More commonly spelled Daboëcia. Syn., *Boretta*. *Ericàceæ*. Low evergreen shrub with alternate entire lvs. and drooping pedicelled fls. in long terminal racemes: corolla ovoid, contracted at the mouth and shortly 4-lobed, with recurved lobes; stamens 8, included: capsule 4-celled, dehiscent. One species in western Europe. Very pretty heath-like shrub, with purple or white fls. in elegant loose racemes, well adapted for rockeries or borders of evergreen shrubberies. Requires protection north during the winter, and thrives best in a peaty, sandy soil. Prop. by seeds treated like those of Erica, and by cuttings of half-ripened wood under glass.

polifòlia, Don (*D. Cantábrica*, Koch. *Menzièsia polifòlia*, Juss.). IRISH HEATH. To 2 ft.: branchlets glandular pubescent: lvs. elliptic, the uppermost narrower, revolute at the margin, whitish tomentose beneath, shining and dark green above, ¼–½ in. long: racemes many-fld.: corolla ⅓–½ in. long, purple in the type. June–Oct. Ireland, W. France, N. Spain. Gn. 52:1142. Gt. 47:1450. L. B. C. 20:1907. S. B. F. G. 2:276. There are many varieties, as **álba**, with white fls.; **bícolor**, with white and purple striped fls.; **ròsea**, with pink fls.; **grandiflòra**, with larger purple fls.

ALFRED REHDER.

DÁCTYLIS (Greek, *finger*, from the size of the spikes). *Gramíneæ*. COCK'S-FOOT. A perennial tufted grass with flat-keeled or folded leaf-blades, and narrow panicles which expand when in flower: spikelets several-flowered, much flattened, sessile, and densely crowded in thick one-sided clusters. A single species in Eu., Asia and N. Africa, also naturalized in Australia and N. America.

glomeràta, Linn. ORCHARD GRASS. Fig. 657. A somewhat coarse grass forming dense tufts. Culms 2–3 ft. high, very leafy: lvs. flat, spreading: spikelets compressed, 3–5 fld.: fl.-glumes lanceolate, very acute or short awn-pointed, ciliate on the keel above.—One of the best known and most useful pasture grasses, and useful for lawns under trees.

Var. **variegàta**, Hort., is a dwarf form of neat, compact habit, with beautifully variegated silver and green foliage.—Well adapted for forming edgings. It grows 1½–2 ft. high, and is prop. by divisions.

P. B. KENNEDY.

DACTYLOCTÈNIUM (Greek, *daktylos*, finger, and *ktenion*, comb). FINGER-COMB GRASS. This genus closely resembles Eleusine, from which it differs chiefly in having the terminal spikes shorter and each tipped with a sharp prolongation of the axis. Annual, with culms tufted or creeping, and rooting at the joints, 1½–2 ft. high. Spikes usually 3–5 in number, digitate, about 2 in. long; spikelets several-fld., crowded in two rows along one side of a continuous axis. Species 2, one in Australia, and the other appearing as a weed in all the warmer countries of the world.

Ægyptìacum, Willd. (*Eleusìne Ægýptica*. *Cynosùrus Ægýptius*, Linn.). CROW-FOOT. Spikelets very closely packed, spreading at right angles to the rachis, 2 fld., with rudiments of two other fls.—An ornamental grass introduced into N. Amer. from Asia or Africa. Mojave Indians of S. California use the grain for food. In Africa a decoction is prepared from the seeds for inflammation of the kidneys.

P. B. KENNEDY.

DÆDALACÁNTHUS (Greek words, meaning an *Acanthad of curious structure*). *Acanthàceæ*. This genus contains some tender shrubs of difficult culture under glass, but great favorites in the tropics, particularly in India. *D. nervosus* is a popular winter and spring-blooming shrub in S. Fla. It has blue flowers, an inch across, 5-lobed, and shaded purple at the mouth of the tube. The names are much confused with those of Eranthemum. The kinds mentioned below are, however, very distinct, from the garden standpoint, from any given in this work under Eranthemum by the color of their fls. and the great size and relative showiness of their bracts. For culture, see *Justicia*.

A. *Fls. dark blue.*

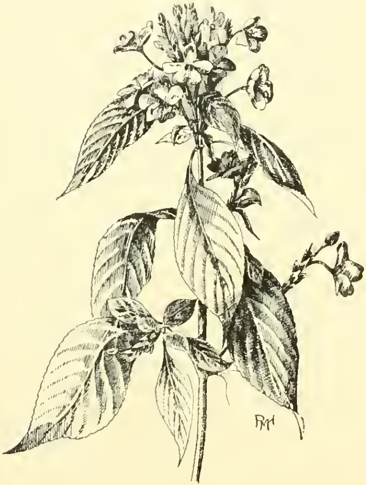
nervòsus, T. Anders. (*Eránthemum pulchéllum*, Andrews and some dealers, while that of others is *E. bícolor*, and of Roxburgh is *D. purpurascens*. *E. nervòsum*, R. Br.). Fig. 658. Lvs. ovate or elliptical, acuminate at both ends, somewhat crenate or entire: spikes axillary, opposite, overlapping: bracts elliptical, acute: limb of the corolla as wide as the tube is long. India. B.M. 1358 as *Justicia nervosa*. Gn. 51:1118. G.C. II. 21:415.—A very pretty shrub for the warmhouse, its fls. being of a color that is not very common in winter-blooming plants. It is an easy subject to manage, requiring a light, rich soil, full sunlight and plenty of water. Cuttings of young growth root readily in a warmhouse.

657. Dactylis glomerata—Orchard Grass (× ¼).

AA. *Fls. purple.*

purpuráscens, T. Anders. (*E. purpuráscens*, Wight. *E. pulchéllum*, Roxb., not Hort.). Lvs. broadly ovate, cuspidate-acuminate, repand-crenate: spikes as above bracts ovate-rhombic, with a slender beak, ciliate. Inserted for contrast. Probably not cult. India.

W. H. Taplin and W. M.



658. Dædalacanthus nervosus (× ⅓).

DÆMÓNOROPS (probably means God-like, of divine appearance). *Palmàceæ*, tribe *Lepidocárpeæ*. Slender palms, differing from Calamus in the deciduous, cymbiform or open spathes. Species about 40. Tropical Asia. Same culture as Calamus. *D. Draco* produces some of the "Dragon's Blood" of commerce.

calicárpus, Mart. (*Calamus calicárpus*, Griff.). Stem erect or climbing, 1 in. diam.: lvs. 6–8 ft. long, upper small with long flagella; lfts. very many, 12–13 in. long, ⅓–½ in. wide; petiole 1 ft., base not gibbous or puckered. Malacca.

Lewisiànus, Mart. (*Cálamus Lewisiànus*, Griff.). Stem climbing, 1 in. diam.: petiole 1 ft., base much swollen, armed below with scattered, short, deflexed spines, and above with straight and hooked spines 1¼ in. long; lfts. 13–15 in. long, ¾–1 in. wide; sheath armed with solitary or seriate flat back spines. Penang.

Palembánicus, Blume. Stem erect: lvs. pinnate, broadly ovate, bright cinnamon-brown when young, and lfts. many, long, narrow; petioles erect, with stout spines on the back, which are deflexed and not thickened at the base. Sumatra.

periacánthus, Miq. Height 15 ft. Resembles *D. Palembanicus*, but the young lvs. are nearly straw-colored, and the spines are placed in irregular rings. Sumatra. —A most graceful species.

melanochæ̀tes, Blume. Stem erect: lvs. pinnate, the pinnæ long and narrow, dark green and drooping, the petioles sharp-spined at the sheathing base. Malaya. —Very decorative. A small form is Var. **microcárpus.**

intermèdius, Mart. Lvs. long-petioled, 4–6 ft. long: lfts. opposite or scattered, 18–20 in. long, 1–1½ in. wide, linear-lanceolate, acuminate, margins and 3–5 costæ bristly above and below; rachis semi-cylindrical, sparingly armed; petiole 1 ft. long, with flattened spines; stems at length 15–20 ft. long, ¾ in. in diam. Malaya.

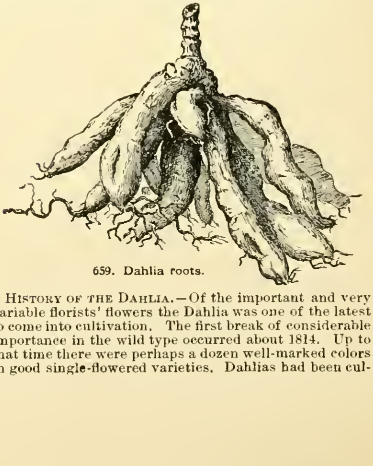
plumòsus, Hort. Graceful plume-like lvs., with pinnæ 4 ft. or less long, petioles with rigid black spines with white bases. India.

Jared G. Smith.

DAFFODIL. See *Narcissus.*

DÁHLIA (named after Professor Andreas Dahl, a Swedish pupil of Linnæus, and author of Observationes Botanicæ, a work of minor importance). *Compósitæ.* Dahlias are amongst the commonest and most important garden plants. The spelling of the word Dahlia shows that the *a* should be given the broad sound, but in England it is everywhere given the long sound, and in America it is often given the short sound. The long sound of *a* makes the word indistinguishable from the leguminous genus Dalea, named after Dale. In Germany Dahlias are still commonly called *Georginen*, because in 1803 Willdenow gave the name Georgina to these plants under the mistaken impression that some very different plants had been previously described as Dahlia. Practically all of the named varieties of Dahlias have come from one immensely variable species, usually known as *D. variabilis.* For garden purposes, however, a second form of great importance, *D. Juarezii*, the parent of the cactus forms, must be kept distinct, as will be explained later. There are 5 other species cultivated to a slight extent. The genus has many names of species, but most of them are synonymous and ill-understood names. There are perhaps 8 or 9 fairly distinct species altogether, Mexican almost exclusively, with a very few in Central and South America. It is curious that these showy plants should be closely related to a common weed, the beggar's tick, of the genus Bidens; but other species of Dahlia have leaves whose forms pass gradually into those of Bidens. Other close allies are Cosmos and Coreopsis. Cosmos flowers are some shade of purple, rarely white in wild nature, and only one species has yellow fls.; Coreopsis has yellow fls. only; Bidens yellow or white; and none of these genera have produced double-flowered forms of the first importance. Dahlia has all these colors and more, being far richer in bright reds, and lacking only sky blue and its closely related hues, which are seen to perfection in the China Asters. Few cultivated plants have such a wide range of colors as the Dahlia; even the Chrysanthemum is distinctly inferior in range, as it lacks the brilliant and vivid scarlet, vermilion, and other shades of red.

Although Dahlias are popular plants, especially in old gardens, they are destined to still greater popularity from the new "Cactus" and "Decorative" types. There exists a prejudice against Dahlias in many localities where these new types have never been seen. This prejudice is part of a reaction against formal and artificial flowers in general. The old-time Dahlias were as round and hard and stiff as a ball. The new-time Dahlias are flatter, and tend towards loose, free, fluffy chrysanthemum-like forms. The possibilities of the old form have been practically exhausted; those of the new form seem to be almost as boundless as those of the Chrysanthemum—which is the most fertile in new forms of all the garden composites.

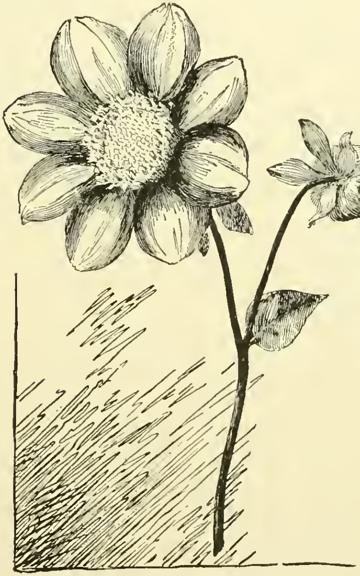


659. Dahlia roots.

History of the Dahlia.—Of the important and very variable florists' flowers the Dahlia was one of the latest to come into cultivation. The first break of considerable importance in the wild type occurred about 1814. Up to that time there were perhaps a dozen well-marked colors in good single-flowered varieties. Dahlias had been cultivated in Europe since 1789, and it is a curious fact that they showed signs of doubling the very first year of their European residence; but it was not until 25 years later that a marked gain in doubling was made. The Dahlia seemed to be undeveloped until 1814, when the era of doubling began. Before another 25 years had passed the Dahlia had sprung into the front ranks of garden plants. In 1826 there were already 60 varieties cultivated by the Royal Horticultural Society. In 1841 one English dealer had over 1,200 varieties. Today it is not uncommon for the leading tradesmen to keep 500–1,000 distinct varieties. In the absence of good records it is conjectured that over 3,000 different names of varieties have been published in the catalogues. Most of the varieties are the Show and Fancy types, which are as spherical and regular as possible, and differ only in color. At first the distinction between the two types seems to have been the same as that between "self colored" and "variegated" flowers in general, the former presenting to the view only one color, while the latter presents two or more colors. Lately, for purposes of exhibition in prize competitions, the following arbitrary distinction has been adopted: A Show Dahlia is often of one color; but if the edges of the rays are darker than the ground color the variety can be exhibited in the Show section. A Fancy Dahlia always has two or more colors, and if the rays are striped or if the edges are lighter than the ground color the variety must be exhibited in the Fancy section. The two types reached full perfection certainly by 1840, and after that date the improvements made were mostly in matters of secondary importance. The immense distance the Dahlia had travelled can be seen in Fig. 663. These types held full sway until about 1879, when the first Cactus Dahlia appeared in England with a promise of new and freer forms. Most of the longest-lived varieties belong to the Show and Fancy type. This form is the one which is perhaps farthest removed from nature, and it is probably so highly esteemed largely because the most work has been spent on it.

A reaction against formalism in all departments of life and thought set in about the time of our own Civil War. It was in the sixties that the Japanese Chrysanthemums did much to emancipate the floral world. With Dahlias the reaction came much later and has proceeded more slowly, because the new forms did not come to us ready made, but had to be slowly evolved against long-standing prejudice. The first Cactus Dahlia was so called because of its resemblance in form, but chiefly in color, to the brilliant crimson-flowered *Cereus speciosissimus*, a well-known garden plant. The name is now highly inappropriate because the color range of the pure Cactus type has been extended to include all of the important well-defined colors of which the Dahlia seems capable. The original Cactus Dahlia was named Dahlia Juarezii, after President Juarez, the "Washington of Mexico." It was pictured for the first time in the Gardeners' Chronicle for 1879, and this interesting picture is here reproduced in a reduced size in Fig. 665. The type is still cultivated under the same name, and in all essentials seems to be unchanged.

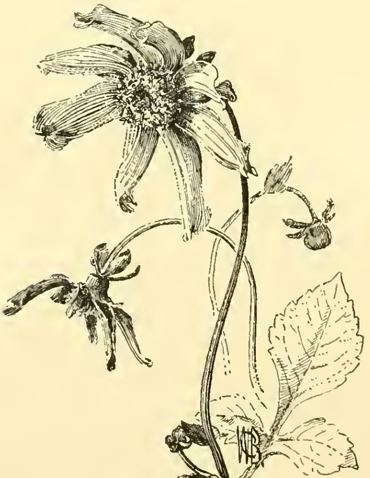
The origin of the Cactus type, as of all the other types of Dahlias, is wrapped in uncertainty, and our efforts to get full and definite information upon some of the most interesting points may perhaps always be baffled. A Dutch dealer got a root from Mexico that produced one plant, which is the parent of all the Cactus forms. It is not known whether the seed which may have produced the original root came from a wild or a cultivated flower. Neither is it known whether any wild single-flowered Dahlia of the Juarezii type has been found. To prove that *D. Juarezii* is at best only a variety of *D. variabilis*, it has been said that seedlings of the former have produced in cultivation forms approximating the Show type of *D. variabilis*. The reverse process is also said to have taken place, but full, authoritative and convincing statements are lamentably wanting. In the garden *D. Juarezii* is exceedingly distinct from the florists' forms of *D. variabilis*. It is usually a slenderer, taller and longer jointed plant, with much handsomer and more delicate foliage, the leaves being narrower than in the coarse and almost ugly foliage of the old forms. It has another peculiarity of growth, which is still one of the most serious defects in the pure Cactus type. The plants tend to hide some of their flowers beneath their foliage. This comes about in a curious way. At a node between 2 young leaves there commonly appear, at about the same time, 3 new growths. The middle one develops into a flower with a naked stalk only 2 or 3 inches long, while the side shoots quickly overtop it and repeat the same 3-fold story indefinitely. The other most serious objection to the pure Cactus type is that it does not stand shipment well, and does not last as long as a cut-flower as the Show Dahlias.


660. A single Dahlia with rounder rays than the wild prototype.

The Decorative or Cactus Hybrid types are numerous, and their popularity comparatively recent. They have been largely seedlings from Show fls. Their rays are rarely, if ever, recurved at the margins. All the other types of Dahlias are well defined, and a single picture of each one will represent its type with sufficient exactness. No one picture, however, can give any conception of the great variety of forms included in this horticultural section. The name Cactus Hybrids means practically "miscellaneous," and is analogous to the "Japanese" section of Chrysanthemums, which is purposely left by the National Chrysanthemum Society as vague and undefined as possible. It is on this section and the pure Cactus type that the greatest hopes for the future of the Dahlia are based.

The Pompon type is a small brother of the Show and Fancy types. It has the same colors and the same form, but the flowers are smaller and more abundant. As a rule the smaller the flowers the prettier and more individual they are. The larger they are, the more they suffer by comparison with the Show type. Perhaps their greatest point is their productiveness. When profusion is the main idea, not great size and quality, the Pompons are the favorite type of Dahlia for cut-flowers. The single flowers may be just as freely produced, but they are not so lasting as cut-flowers.

The Single type has had many ups and downs. In the reaction against formalism it came to the front about 1881, and for several years thereafter several hundred forms were kept distinct, and they were made the chief feature of the European shows. It is exceedingly interesting to get seeds of wild Dahlias from Mexico. They give flowers like the star-shaped one in Fig. 663. When the Dahlia first came into cultivation its rays were relatively long, slender, acuminate, notched at the end, and with such wide spaces between the tips of the rays as to give the flower the stellate appearance seen in Fig. 663. In the course of the evolution of the single type, the gardeners retained the most regular and symmetrical forms. Single Dahlias with always and only 8 rays were preserved. The rays of Dahlias became broader and rounder, as in Fig. 660, until finally in pedigree varieties they closed up the vacant spaces, and the flower presents to the eye one unbroken picture—one concentrated impression of a single color. The same mental ideals have produced the rose-petaled Geraniums and the shouldered Tulips. In a high bred single Dahlia there are no minute teeth or notches at the tips of the rays.



661. A Dahlia of the Single Cactus type (× ½).

In the wild Dahlia, no matter what the color of the ray may be, the base of the ray is usually yellow; sometimes this yellow is very objectionable. Two different policies have been pursued in the matter—suppression and encouragement. Most of the single Dahlias of high pedigree have rays of uniform coloration with no secondary color at the base, but a few have a distinct ring of color at the base, often called an "eye or crown," which is sometimes yellow and rarely red or some other color. Usually the rays of a single Dahlia are spread out horizontally, sometimes they bend back, and rarely they bend inwards and form a cup-shaped flower. These three forms can doubtless be separated and fixed during those periods when the interest in the Single type warrants it.

Single Dahlias are likely to lose some of their rays after a day or two in a vase. In cutting them it is well to select the younger flowers. A vigorous shake often makes the older ones drop their rays. It is an easy matter to keep the seeds from forming and save the strength of the plant for the production of flowers.

There are three modern types of minor importance,—the Single Cactus, Pompon Cactus and Tom Thumb. The Single Cactus type differs from the common single type, in having rays with recurved margins, which give a free and spirited appearance to the fls. Instead of spreading out horizontally, the rays often curve inward, forming a cup-shaped flower. This type originated with E. J. Lowe, Chepstow, Eng., was developed by Dobbie & Co. about 1891, and was first disseminated in 1894. The Single Cactus Dahlias are very novel, interesting and pretty. There should be a Pompon Cactus form to connect the Single Cactus and Cactus types, just as the Pompon is intermediate between the Single and Show types. The writer has seen only two varieties of this type, "Pompon Cactus" and "Little Cactus." They have small fls., with flat, reflexed rays. The Tom Thumb type is a miniature race of round-rayed single Dahlias, which grow from 12–18 inches high, and are used for bedding. The type originated in England with T. W. Girdlestone, and was developed and introduced by Cheal & Sons. The "green" Dahlia can hardly be called an important type, but it is an interesting abnormal form, in which the rays are partially or wholly suppressed, and the chief feature of interest is a confused mass of green stuff, not resembling petals at all, but evidently a multiplication of the outer involucral scales, which, in the Dahlia, are green, leafy bracts. This form is essentially unstable and unhealthy. It can never be propagated extensively. This freak was pictured as long ago as 1845 in G.C., p. 626. Several different varieties have probably degenerated into this condition. See F.S. 19:1994. Another interesting variation, which hardly ranks in present importance with the 9 types contrasted below, is the laciniated form, which makes a very pretty and novel though rather formal effect. Examples are Germania Nova, Mrs. A. W. Tait and its yellow variety among large double forms, and White Aster among the Pompons. In these cases, the notches at the tips of the rays, instead of being minute and inconspicuous, are deepened so much that they give the laciniated effect. At present this form is available in a very narrow range of colors. It is not probable that it will be an important factor in producing chrysanthemum-like forms. Another form which baffles description, but is nevertheless very distinct, is that of Grand Duke Alexis. It is nearer the Show type than any other, but is perhaps best classed with the Cactus Hybrid section, simply because it seems advisable to keep the Show type the most sharply defined of all. It is to be hoped that the form of Grand Duke Alexis can be repeated in all the leading colors. Grand Duke Alexis is a very flat flower, and the rays are remarkably folded, leaving a round hole at the top of each. About midway between Grand Duke Alexis and the show or cupped type is an interesting form, the "quilled" Dahlia, a name which is necessary, perhaps, though unfortunate. In A. D. Livoni (which is one of the most popular of all Dahlias, and the nearest approach to a pure pink untainted by any suggestion of purple derivation) the rays are rather tightly folded for about two-thirds of their length, leaving a round hole at the tip as in Grand Duke Alexis, but giving a peculiar whorled effect, which plainly shows the spiral arrangement of the successive tiers of rays. Among Pompons, Blumenfalter is an example of this rosette-like or quilled form, and many colors are procurable. However, the word "quilled" usually suggests a long tube with a flared opening, whereas in the form described above the margins of the ray are merely rolled tightly together, but not grown together into a thin, seamless tube. Perhaps the most important variation that has not yet appeared in the Dahlia, is the wonderful elongation of the disk florets into long, thin, variously colored tubes which have produced such charming effects in the China Aster and have culminated in the marvelous grace of such Chrysanthemums as Iora, Northern Lights and Lillian B. Bird. The Dahlia may not be denied such possibilities, for in G.C. III. 20:339 (1896) a new Dahlia was described in which the quills are really tubes for two-thirds of their length. May we hope for some striking development of this form within our generation?

The main types of Dahlias may perhaps be distinguished more clearly by the following scheme:

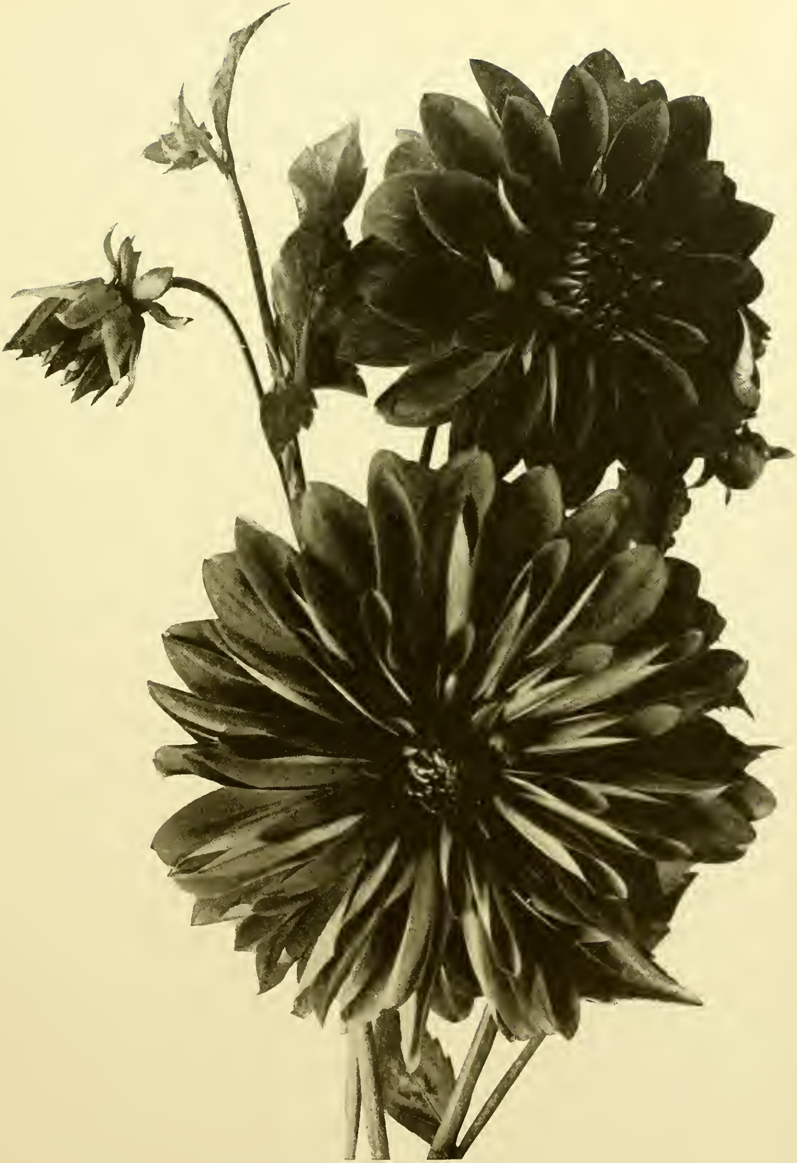


Plate IX. A modern Dahlia
One of the decorative or Cactus Hybrid section

A. *Plants not very dwarf.*

B. *Fls. single.*

C. *Rays flat, not recurved at the margins.*

1. THE SINGLE TYPE. Fig. 660.

CC. *Rays with recurved margins.*

2. THE SINGLE CACTUS TYPE. Fig. 661.

BB. *Fls. double.*

C. *Size of fls. small, 1–2 in. across.*

D. *Rays cupped.*

3. THE POMPON TYPE. Fig. 662. Also called "Bouquet" and "Lilliputian."

DD. *Rays flat.*

4. THE POMPON CACTUS TYPE.

CC. *Size of fls. large, 3–5 in. across, averaging 4 in.*

D. *Rays cupped.*

E. *Colors single, or the edges darker than the ground color.*

5. THE SHOW TYPE. Fig. 663.

EE. *Colors 2 or more, striped, or with edges lighter than the ground color.*

6. THE FANCY TYPE.

DD. *Rays not cupped, but long and flat, or with recurved margins.*

7. THE CACTUS TYPE. Figs. 665, 666.

DDD. *Rays various in form.*

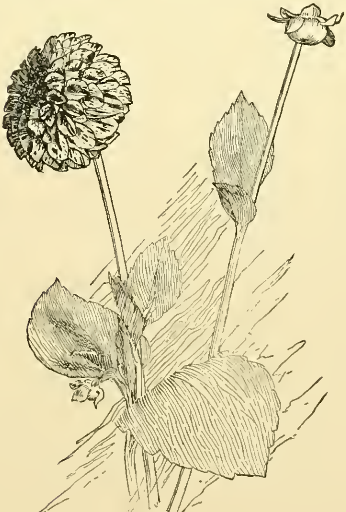
8. THE CACTUS HYBRID TYPES. Also called "Decorative" Dahlias.

AA. *Plants very dwarf.*

9. THE TOM THUMB TYPES.

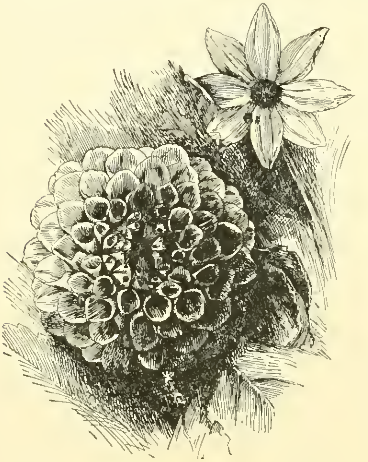
SOCIETIES AND SHOWS.—The Dahlia is one of about a dozen genera of plants whose horticultural value has been attested by permanently successful special societies. There are national Dahlia societies in England and America. Dahlia shows are usually held the second or third week of September. With the growing interest in nature-study, attempts are being made to make a permanent institution of local fall flower shows, which shall come at a sufficient interval before the Chrysanthemum shows, and in which the children may exhibit their own products. The Dahlia and China Aster are especially suited for such shows.

GARDEN EVOLUTION OF DAHLIAS.—In the evolution of Dahlias in general, some of the great changes are as follows: (1) The growing season has been greatly shortened and the flowering season lengthened. In these and in all other particulars Dahlias were wonderfully variable even in the first decade of their European culture, but in general they bloomed for only a few days before frost. Nowadays, the Dahlia season is in full force a month and a half or two months before frost with a good show of blooms in favored localities for Independence Day; and June 15th is a record of extreme earliness for Wm. Agnew, after six weeks' growth from tubers planted out of doors. (2) The colors of the flowers have been greatly improved, as even the most sentimental objector to the idea of "improvement" in flowers would have to acknowledge if confronted with wild and cultivated plants. The number of colors has been greatly increased and the vividness of the colors intensified. Most people can distinguish and enjoy from 12 to 30 colors, and these colors have occurred in each type and been carefully saved, purified and strengthened. Dull and intermediate shades tend to drop out. (3) Immense numbers of variegated forms are produced. Broadly speaking, variegation is perhaps later to appear than pure colors, and is conserved by a formality-loving class. It is said that the Fancy Dahlia originated later than the Show Dahlia, and was for many years inferior in size and outline. It is also said by botanical collectors in Mexico that wild Dahlias are mostly self-colored, rarely variegated. Among the bewildering variety of variegated Dahlias the leading types of variegation are perhaps only 5: (*a*) the "tipped" or "shaded" Dahlias, a very common form, in which the upper part of the ray is evenly painted with another color, the former term being used for the smaller, and the latter for the greater amount of secondary color; (*b*) the "edged" Dahlias, in which the secondary color is confined to the sides of the rays, does not affect the tip, and is usually a broad strip; (*c*) the "margined" Dahlias, with a very narrow strip of color which outlines the whole margin of the rays, and often gives a very delicate and dainty effect; (*d*) the "striped and banded" Dahlias, with broad bands down the middle, and often merging into the "edged" forms; (*e*) the "mottled" Dahlias, which are variously dotted and splashed. (4) Returning now to the broad features in the evolution of the Dahlia, a fourth is the production of varieties with long flowering stems suitable for cut-flowers. Many of the old sorts have thick, short stems with superabundant foliage, which requires thinning. (5) The process of doubling has been carried to an extraordinary degree. The "yellow center" has been the one thing about a forming variety that the florist has hated most and has most relentlessly suppressed. It is often a sign of poor stock. The temptation to over-propagate novelties is almost irresistible, and the appearance of a disk is usually taken as a symptom of over-propagation or deficient culture. A yellow center is considered objectionable by most people when it occurs with rays of magenta or allied shades, as the colors conflict. There is no question that it breaks the absolute regularity and unity of a perfect show flower, but it is a question, especially with white and yellow-rayed forms, if the yellow disk does not often add a pleasant variation. Aside from matters of taste, it is probable that no other florists' flower has had more full, precise and minute rules laid down for its perfect form than the Show Dahlia. The process of doubling seems to be associated with a cool climate. Dahlias soon degenerate to a relatively single condition in our southern states, and new stock of desired varieties has to be secured from the north. (6) The habit has been vastly im-



662. The Pompon type (× ½).

This is really a Fancy variety, but the only distinction is one of size, and compared with Fig. 663 this is a Pompon.



663. A Show Dahlia and its wild progenitor (×½).

proved. Wild Dahlias, when brought into cultivation, soon grew too tall to be self-supporting. An old-fashioned unbranched Dahlia tied to a large and ugly stake was often a hopeless and helpless object. Many varieties of Dahlias can be made to branch at the ground and become self-supporting by successive early pinchings of the leading shoots, but some varieties seem to be too firmly set in the old tree-like habit to submit to pinching. In the early days the average height of plants may have been 5 ft. Nowadays 3 ft. is perhaps the average, but the tendency to retain only dwarf forms still continues, and the Dahlia must ultimately be freed from stakes. The main thing is to secure the good flower first and improve the habit later, if possible. It is to be hoped that the coarser kinds of foliage will give way to more graceful and attractive forms. The "fern-leaved" type is a much cut and delicate kind. Ami Barillet has handsome dark purple, finely cut foliage. All the above features represent general tendencies which, however, work out very differently in each important case.

The Dahlia has had one difficulty as peculiar to itself as the calyx bursting of the Carnation, or the different values of crown and terminal buds of Chrysanthemums. They are often troubled with a "green eye." This is a hard round button in the center of a blossom formed by the inner involucral bracts, which, at that stage, are longer than the unopened rays which they protect. Oftener still, this "green eye" is followed by a yellow center. This "green eye" is still considered to destroy the unity of a flower, and in exhibitions is often surreptitiously removed. The yellow disk can be cut out with a knife and the innermost rays carefully replaced. A fundamental difficulty associated with this matter is the slowness with which some Dahlias open. The outer rays open first, and in Fig. 663, where the successive stages are shown: the outer ones are the most expanded; then comes a series of cupped rays; then some that are tightly folded with two creases, and finally the hard green eye. A poor Show Dahlia opens slowly, and shows an eye while the outer rays are tumbling out, withering, or being burned by the sun. A good Show Dahlia opens its tiers in rapid succession, and shows no green eye.

Literature.—As in many other cases, the magazine literature of the Dahlia is the most bulky, and, in some respects, more important than the books on the subject. The latest bibliography is that by C. Harman Payne in G. C. III. 21: 329 (1897). There have been about 25 books devoted to the Dahlia, many of them pamphlets and cheap cultural manuals. These books were mostly published from 1828 to 1857, with none at all for nearly 40 years after that date until 1896, when Lawrence K. Peacock's book, The Dahlia, which is the best American book, made its appearance. The first American treatise was by E. Sayers, published at Boston, 1839, and now forgotten. Many interesting facts came out in 1889, the centennial year of the Dahlia. A report of the National Dahlia Conference is reprinted from the Journal of the Royal Horticultural Society for 1890, but Shirley Hibberd's statements therein regarding the botany of the Dahlia agree very poorly with Hemsley's revision of the genus in G. C. II. 12: 437, 524, 557 (1879), which is the latest botanical monograph.

A. *Height tall, tree-like.*

B. *Fls. nodding, bell-shaped.*

imperiàlis, Roezl. Height 6–18 ft.: stem usually unbranched, knotty, 4–6-angled: lvs. 2–3-pinnately parted; leaflets ovate, narrowed at the base, acuminate, toothed, with a few short scattered soft hairs: fls. nodding, 4–7 in. across, white, more or less tinged with blood red, especially at the base: rays sterile or pistillate, lanceolate, sharp-pointed, not 3-toothed at the apex. Gt. 1863: 407. G.C. 1870: 459; II. 12: 437. B.M. 5813. Gn. 12: 95; 33, p. 527. R.H. 1872: 170. A.G. 15: 313. Mn. 8: 61.—As few conservatories can make room for so large a plant, it is common to graft this species on dwarf varieties of *D. rosea*. The inflated and pointed fl.-buds (3–4 in. long) are very characteristic. It is not known whether the original plant collected by Roezl was found in wild or cultivated surroundings. This species and the next are mostly cultivated under glass; the others are grown outdoors in summer, and the roots stored in winter.

BB. *Fls. erect, not bell-shaped, but opening out flat.*

excélsa, Benth. (*D. arbòrea*, Regel). Height 20 ft. or more: stem usually unbranched, glaucous, marked with horizontal rings made by the stem-clasping base of the petioles as the lower lvs. fall away: lvs. bipinnate, as much as 2½ ft. long, 2 ft. wide: leaflets as many as 25, ovate, those of the upper lvs. often contracted at the base, acuminate, toothed, pale green beneath, with a few short scattered hairs or none: fls. 4½ in. across, dilute purple, crimson-pink. Maund, Botanist 2: 88 (1838?). G.C. II. 19: 80.—This was described from a cultivated plant with 8 rays in a single row, but with considerably elongated disk fls. It was almost an anemone-flowered type, and

664. A semi-double form of Dahlia (×⅓).
This is one of many that have been crowded out in the struggle to perfect the Show and Fancy types.

all the florets were sterile. *D. arborea* has never been sufficiently described, but plants have been cultivated for many years under this name. The tree forms of Dahlias are not sufficiently known.

AA. *Height medium, averaging 3 ft., commonly from 2–5 ft., rarely exceeding these extremes.*

B. *Lvs. once pinnate: stem not branching from the base: habit erect.*

C. *Stems not glaucous: rays fertile.*

D. *Rays of the single fls. not recurved at the margins; of the double fls. never flat, but cupped.*

ròsea, Cav. (*D. variábilis*, Desf.). Fig. 663. The original of practically all the old-fashioned Dahlias, particularly the Single, Pompon, Show and Fancy types. It is therefore the parent of the vast majority of the horticultural varieties. Lvs. typically once pinnate, sometimes bipinnate; leaflets ovate, toothed, broader and coarser than in the other species. B.R. 1:55. B.M. 1885.—This is a wonderfully variable species. Some plants are densely hairy, others scarcely at all. The lvs. are sometimes bipinnate in parts of plants or throughout an entire plant. In double forms the rays usually have abortive pistils. Many garden forms have glaucous stems. Some authors have doubted whether this species is distinct from *D. coccinea*, but the two types are very distinct, particularly in the garden, although there are intermediate forms in nature.

DD. *Rays of the single fls. with recurved margins; of the double fls. not cupped, but long, flat and pointed, and some at least with recurved margins.*

Juarézii, Hort. (*D. Yuarézii*, Hort.). Figs. 665, 666. The parent of the pure Cactus Dahlias. These all originated from one plant, which was flowered in Europe for the first time in 1864, and first pictured in G. C. II. 12:433 (1879). F.M. 1879: 383. Gn. 18, p. 589; 19: 283; 50, p. 236.

CC. *Stems glaucous: rays not fertile.*

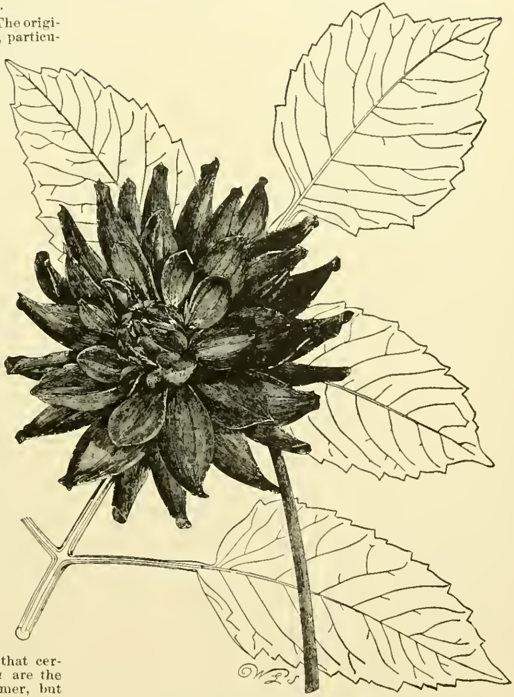
coccínea, Cav. Fig. 667; see B. M. 762 (1804). Always more slender than *D. rosea*, with narrower leaflets, and in the wild, at least, dwarfer than the *D. rosea*. The color range is much smaller, and does not include white or any shade of purple or crimson. The colors vary from scarlet, through orange to yellow. There are no double forms, and it has been frequently said that this species will not hybridize with *D. rosea*. The named varieties pictured in I.H. 31:515 and 533 (1881), which are emphatically declared to be varieties of *D. coccinea*, are probably garden forms of *D. rosea*. The only characters that certainly distinguish *D. coccinea* from *D. rosea* are the glaucous stems and infertile rays of the former, but these characters break down in garden forms. B.M. 762. Gn. 19:270. G.C. II. 12:525.

BB. *Lvs. twice pinnate: stems branched from the base: habit spreading.*

Mérckii, Lehm. (*D. glabràta*, Lindl.). Fig. 668; confer B.M. 3878 (1841). Height 2–3 ft.: roots much more slender than those of *D. rosea*: stem and lvs. wholly devoid of hairs: lvs. bipinnate: floral bracts linear: fls. typically lilac; rays pistillate: outer involucral bracts linear. B.R. 26: 29 (1840). Gn. 19: 270 (1881). —This is a very distinct garden plant, and is worth growing merely as a foliage plant. Seeds of species gathered from wild plants in Mexico by Pringle have been grown at the Cornell Experiment Station lately. The fine-cut character of the foliage makes it vastly more attractive than the coarse foliage of most of the varieties of *D. rosea*. Several of these seedlings had beautiful dark red or purple foliage. The plants are much dwarfer and wider spreading than most florists' Dahlias, and show no stem while growing. The branched flowering stems are remarkably long, slender and wiry, often rising 2–3 ft. above the foliage. The rays are very short and often roundish, with a short sharp point instead of 3 minute teeth. There are no red, yellow or white forms in nature. The roots of this and *D. coccinea*, being slenderer than those of *D. rosea*, must be preserved with greater care during winter.

D. Zimapani. See Cosmos diversifolius. W.M.

Propagation.—There are four methods by which Dahlias are propagated: by cuttings (an important commercial method); by division of roots (the amateur's method); by grafting to perpetuate rare kinds; and by seeds, to produce new varieties.



665. The original Cactus Dahlia (×½).
Photographed and reduced from the Gardeners' Chronicle, where it was first pictured.

Division of Roots.—This is the easiest and most satisfactory to amateurs. As the eyes are not on the tubers, but on the crown to which the tubers are attached, care must be taken that each division has at least one eye, otherwise the roots will never grow. It is, therefore, best to start the eyes by placing the roots in a warm, moist place a short time before dividing. The roots are sometimes placed in a hotbed, and shoots grown to considerable size, then set out as plants; but this plan has many drawbacks, and is not advised.

Cuttings.—This method is used mainly by commercial growers, and though the amateur may propagate plants successfully, the attention a few cuttings would require would be so great that it would be cheaper to buy plants. The roots are planted closely in benches in the greenhouse early in January, and cuttings are made from the young shoots as fast as they form the third or fourth set of leaves. These cuttings are carefully trimmed and placed in pure sand in the propagating bench, using a dibble, and putting the cuttings in rows about 3 in. apart and ½–1 in. between the cuttings.

The propagating bench is made by running a flue, hot water or steam pipes beneath an ordinary bench, and boarding up the side to confine the heat. Although there may be a difference of opinion among propagators, yet a bottom of sand heat of 65°, with the temperature of the house from 5–10° less, will give the best practical results. With this temperature, the cuttings will root in about two weeks, and will be far stronger than if rooted in less time with greater heat. As soon as cuttings are rooted, they are potted off into small pots and grown in a cool greenhouse until danger of frost is over, when they are planted out in the open ground. Cuttings made too far below a joint, or too late in summer, will produce flowering plants but no tubers.

Grafting.—This is a very interesting, though not profitable, mode of propagation. The top of the tuber is cut slantingly upward, and the cutting slantingly downward, placed together and tied with raffia or any soft, handy material. They are then planted in a pot deep enough to cover the lower part of the graft with earth, and they will soon adhere if placed under a hand glass or in a frame. Grafting is practiced only for the preservation of rare and weak-growing sorts.

Seeds.—The chief use of seeds is the production of new varieties. Seeds are also used by those who chiefly desire a mass of color, and are not particularly desirous of finely formed blooms. If planted early enough indoors and transplanted to the open as soon as safe, fine masses of color can be secured before frost, and the roots of the more desirable kinds can be saved, and will give even better results the next season.

POSITION.—Dahlias are easily destroyed by high winds unless they are given a protected position, and they need plenty of air and sunlight for best results. In shaded, close, airless quarters the growth is sappy and the flowers are poorly colored.

SOIL.—The soil is not so important, except in its ability to hold moisture during severe droughts. Any rich soil that will grow corn will also grow Dahlias to perfection, if all other conditions are favorable. They will grow equally well in clear sand, clay or gravel, if the proper kinds and quantities of plant-food are added and well and thoroughly worked in. It is, however, unreasonable to expect Dahlias or any garden plants to succeed in a hard clay, devoid of humus, easily baked and never tilled.

FEEDING.—It is always best to broadcast the manure and plow or spade it into the soil; thorough spading is absolutely necessary if the manure is not well decomposed. On heavy clay or gravelly soils, loose, coarse manure may be used, but on light or sandy soils, manure should always be fine and well-rotted. Commercial fertilizers are also largely used, and are most valuable when used in connection with manure. Any good fertilizer, rich in ammonia and phosphoric acid, with a liberal amount of potash, will answer at the time of planting, but as a top-dressing later, nothing equals pure bone meal and nitrate of soda, 4 parts bone to 1 part soda.

KINDS OF STOCK.—Dahlias are offered in five forms: large clumps, ordinary field roots, pot roots, green plants and seeds. The clumps give the best satisfaction the first year, but are entirely too large and unwieldy for anything but a local trade and exchange among amateurs. The ordinary field roots are the most valuable, as they can be easily and safely handled, and always give satisfactory results. Pot roots are largely used in the mailing trade, and, while they will not always give as good results the first year, are valuable for shipping long distances, where larger roots could not be profitably used owing to heavy transportation charges. Green plants are mainly used to make up any deficiency in the field crops, owing to unfavorable seasons, or an unusual demand for certain varieties.

PLANTING.—There is a diversity of opinion as to the proper time to plant Dahlias, but the writer has always found it best to plant early, and would advise planting large, strong roots about two weeks before danger of frost is over. This would be, in the vicinity of Philadelphia, about April 15; and as it takes from two to three weeks for the plants to get up through the ground, there will be no danger, while the plants will bloom that much earlier. It is best, however, not to plant small roots or green plants until danger of frost is over—in the vicinity of Philadelphia, about May 1 to 10, according to the season. A good rule to follow everywhere would be to plant small roots and green plants as soon as danger of frost is over, and large roots about three weeks earlier.

TILLAGE.—The first requisite of successful garden cultivation is to thoroughly stir the soil to considerable depth and enrich it, if it is not already rich, by broadcasting and plowing or spading in a good coat of well rotted manure. Too much stress cannot be placed upon the thorough preparation of the soil, as it not only allows

666. Matchless. Half size. A velvety maroon Cactus Dahlia.

the roots to go down deep after the moisture more readily during dry weather, but affords good drainage during excessive rains. Having prepared the soil as above, mark out rows 4 ft. apart and 6 to 8 in. deep, and plant the roots from 18 in. to 3 ft. apart in the row, according as solid rows or specimen plants are desired.

During its early stage of development, the Dahlia grows very rapidly, and should be kept thoroughly tilled. But while deep tillage is beneficial during its early stages of development, it is almost fatal to the production of flowers if practiced after the plants come into bloom. Therefore, when the plants commence to bloom, cease deep tillage and stir the soil to the depth of 1 to 3 in. only, but stir it often, and never allow the surface to become hard and baked. This will not only prevent excessive evaporation of moisture and keep the under soil cool and moist, but will also prevent the destruction of immense quantities of feeding roots.

As long as the roots supply more nourishment than is needed to support the plant, both the plant and the flowers increase in size and beauty; but as the supply gradually becomes exhausted, the plants cease growing and the flowers become much smaller. This condition is what is generally called "bloomed out," but what is really "starved out," and can easily be prevented if the proper attention is given to the plants. As soon as the flowers commence to grow smaller, broadcast around each plant a small handful of pure bone meal and nitrate of soda, in proportion four parts bone to one part soda, and carefully work it into the soil.

Watering.—This is a debatable subject, and, although a judicious application of water during a severe dry spell is very beneficial, yet in nine cases out of every ten where water is applied a thorough stirring of the surface soil would give better results.

Many people believe Dahlias should be watered every evening, and as soon as they are up commence watering them daily unless it rains. This practice is very injurious, as it causes a rapid but soft growth, and as the soil is seldom stirred, the roots become so enfeebled for want of air that they are unable to supply the needs of the plant; as a consequence, but few buds are formed, and they generally blast before developing into flowers. In other cases, as the enthusiasm wears off, watering is stopped, probably right at the beginning of a severe drought, and the weak, pampered plants are fortunate to survive, much less to bloom.

If large, strong roots are planted and the soil is kept thoroughly stirred, there will be little need of artificial watering until after the plants come out in full bloom. However, if it should become hot and dry after the Dahlias come into bloom, it would be very beneficial to give them a thorough watering once each week or ten days during the continuance of the drought. But care should be taken to stir the soil to the depth of 1–2 in. the next day, carefully pulverizing it later, in order to seal the natural capillary tubes by which the moisture is evaporated.

The best rule to follow is not to allow the plants to suffer for want of moisture, nor to water them except where they need it, but to water them thoroughly when necessary, and not to allow excessive evaporation for want of frequent stirring of the soil.

Training.—In planting the roots or tubers, place them on their sides with the eye as near the bottom as possible, and cover only 2–3 in. deep. As soon as the shoots appear, remove all but the strongest one, and pinch out the center of that one as soon as two or three pairs of leaves have formed, thus forcing it to branch below the level of the ground. As the plants develop, the soil is filled in gradually by subsequent hoeings. By this method the entire strength of the root and the soil is concentrated on the one shoot, causing it to grow vigorously; while the pinching back not only causes it to branch below the surface of the soil, and thus brace it against all storms, but also removes all of those imperfect, short-stemmed flowers that appear on some varieties. If the plants are pinched back low, as described, there is no danger of the branches splitting down, as the soil around them will hold them securely in place. However, where they branch above ground and are inclined to split down, drive a short, stout stake near the stem and tie the branches to it. These short stakes are not to hold the plants up, but to prevent the branches splitting down where the above directions have not been followed closely.

The writer was the first to use and advocate this method of training, and by its practice has grown many thousands of Dahlia blooms on stems from 18 in. to 2 ft. long, selling them to florists by the thousands for four times the ruling price of carnations, and higher than that asked for roses.

667. Dahlia coccinea.
See the Botanical Magazine, 1804, plate 762.

Storing the Roots.—As soon as the plants are killed by frost, lift the roots, and, after removing all the soil from them possible, allow them to dry in the air for a few hours, when they should be stored in the cellar or some other cool place secure from frost. If the cellar is very dry or is not frost proof, put the roots in a barrel or box and cover completely with dry sand or some other suitable and convenient material, such as sawdust or tanbark, to prevent freezing or loss of vitality by drying or shriveling.

Varieties.—*For cut-flowers*, the *Decorative* or *Cactus hybrid* kinds are the most valuable, and the following are among the very best: Nymphæa, Clifford W. Bruton, Henry Patrick, Grand Duke Alexis, Wm. Agnew, Perle de la Tete d'Or, Evadne, Orange King, Sundew, Mrs. E. C. Monroe. The *Cactus* Dahlias are beautiful and artistic, but will not last long after being cut. The best are: Aiger, Austin Cannell, Strohlein Kronne, Henry F. Michell, Mrs. Bennett, John W. Roach, Geo. Marlow, Loreley, Beatrice and Mrs. Peart.

Of the *Show* Dahlias, among the best are: Miss May Lomas, A. D. Livoni, Storm King, Emily, Ruby Queen, Arabella, Constancy, Queen of Yellows, Willie Garrett, Lady Maud Herbert.

Fancy: Frank Smith, Miss Browning, Penelope, American Flag, Lottie Eckford, Uncertainty. Of the *Pompon* or Bouquet Dahlias, the best are Snowclad, Fairy Queen, Daybreak, Eleganta, Little Prince, Le Petit Jean, Carol, Little Beauty, Yellow Bird and Red Piper. The *Single* varieties are especially adapted for cutting, but should be cut as soon as opened, otherwise the petals will fall.

For bedding, the plants must be dwarf, of branching habit, and profuse bloomers. A few desirable kinds are: Marg. Bruant, Magnificent, Triomphe de Solferino, Colibre, Snowclad, Sunbeams, Mrs. Dodd and Bloomenfalter.

For Massing and Banking.—Cactus: Aegir, Strohlein Kronne, Mrs. A. Beck, Cyclops, Baron Schrœder.

Decorative: Wm. Agnew, C. W. Bruton, Perle de la Tete d'Or, Evadne, Mrs. E. C. Monroe, Indescent, Wilhelm Miller, Black Beauty, Grand Duke Alexis, Nymphæa, Oriental, Orange Scarlet.

Show: Storm King, A. D. Livoni, Model of Perfection, Willie Garrett, Honest John, Ernest Krebig, Psyche, Bird of Passage, Oakfield, Arabella, La France, Princess Bonnie, Queen of Yellows.

668. Dahlia Merckii.
See the Botanical Magazine, 1841, plate 3878.

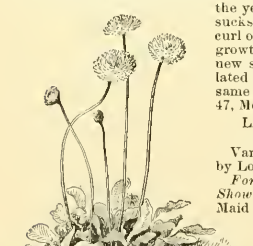
Pompon: Klein Domitea, Snowclad, Carol, Fairy Queen, Catherine, Sunshine, Little Beatrice, Eleganta, Elfin, Miss Lou Kramer, Le Petit Jean, Bessie, Tom and Teddy.

Singles are valuable for this purpose, especially St. George, Ami Barrillet, Ada, John Downie, Evelyn, Isaac Pitman, Painted Lady, Corinne, Brilliant and Nance.

For Borders and Hedges.—No special list of varieties can be recommended for this purpose, as it is largely a matter of taste.

Other Purposes.—Dahlias are used for many other purposes, and are grown in many other forms with pleasing effect. Some train the tall varieties on trellises in espalier form; many train them to tall supports, while others spread them out on the ground and peg them fast, to give the appearance of a bed of large-flowering pigmies. The latter form is quite unique and satisfactory, as plants of some of the varieties grow unusually well and bloom profusely. The Fancy Dahlia Uncertainty and Cactus Dahlia Delicata are typical varieties that seem to do better in this form than any other.

Enemies.—Dahlias are generally remarkably free from enemies, but in some localities the tarnished plant bug (*Lygus pratensis*) makes success impossible, as there is no practical remedy. This bug is chiefly responsible for the blasted buds and one-sided flowers. It pierces the young buds, shoots, and sucks the sap. The shoots curl over, blacken, check the growth of the plant, and new side shoots are stimulated which often meet the same fate. Consult Bulletin 47, Mo. Exp. Sta.


669. Bellis perennis.

Lawrence K. Peacock.

Varieties recommended by Lothrop and Higgins:

For General Purposes.—Show: Dawn, Robin Adair, Maid of Athens, Madam Zules, Madge Wildfire, Miss Miller, A. D. Livoni, Mary D. Halleck, Snow, Bird of Passage, Champion Rollo, Dr. J. P. Kirtland.

Fancy: Rev C. W. Bolton, Young America, Mrs. J. Downie, Rev. J. B. McCamm, John Forbes, Mrs. Browning, Keystone, Frank Smith.

Pompon: Burning Coal, Eurydice, Daybreak, Phœbe, Lillian, Purity, Sunbeam, Little Bessie, Brunette, Fashion, Snowclad, Virginale, Rosalie, Hedwig Polwig, Catherine, Guiding Star, Aillet's Imperial, Alewine, Vivid.

Decorative: Grand Duke Alexis, Wm. Agnew, Juno, Bowery Girl, Josephine, Lyndburst, Perle de la Tete d'Or.

Cactus: Matchless, Bertha Mawley, Mrs. Bennett, Harmony, Edelcactus.

For Exhibition.—Show: Miss Cannell, Wm. Powell, Duchess of York, Harrison Weir, John Walker, R. T. Rawlings, Kaiser Wilhelm, Muriel, Pearl, Alice Emily, James Vick, Emily Edwards, A. D. Livoni, Wm. Fawcett, James Service, Madge Wildfire, Mrs. Langtry, Hector, John Lamont, J. T. Saltmarsh.

Fancy: S. Mortimer, Dorothy, Sunset, Young America, Champion Rollo, General Grant, Mrs. J. Downie, Lottie Eckford, Salamander, Prince Henry, Matthew Campbell, Duchess of Albany, Rev. J. B. McCamm, John Forbes, Frank Smith, Keystone.

670. Ox-Eye Daisy or White Weed—Chrysanthemum Leucanthemum (× ½).

Cactus: Matchless, Ernest Glasse, Mrs. Bennett, John Welch, Harmony, Gloriosa, Mary Hillier, Beatrice, Prince of Orange, Mrs. A. Peart, Starfish, Green's Gem, John Roach.

Decorative: May Pictor, Wm. Agnew, Oban, Juno, Lancelot, Amphion, Bowery Girl, White Swan, Marchioness of Bute, Perle de la Tete d'Or, Rayon d'Or, Wilhelm Miller.

Pompon: Burning Coal, Eurydice, Phœbe, Eleganta, Minnie, Lillian, Hilda Searl, Henrietta, Mars, Purity, Ernest, Sunbeam, Mattie Mourey, Snowclad, Virginale, Rosalie, Iolanthe, Hedwig Polwig, Little Hermon, Golden Gem, Raphael, Alewine, Aillet's Imperial.

For Cut-flowers.—Cactus: Beatrice, Ernest Glasse, John Roach, Harmony, Matchless, Edelcactus, Starfish, Green's Gem.

Decorative: Grand Duke Alexis, C. W. Bruton, Alpha, Wm. Agnew, Nymphæa, Josephine, White Swan, Lyndhurst, Bowery Girl, Oban, Perle de la Tete d'Or, Rayon d'Or, Bennett Goldney.

Pompon: Alewine, Purity, Eurydice, Sunbeam, Rosalie, Guiding Star, Phœbe, Iolanthe, the Minnie, Lillian, Golden Gem.

DAHOON HOLLY. *Ilex Dahoon*

DÀIS (Greek, *pine torch;* application not obvious). *Thymelæàceæ.* This genus contains a tree that yields a strong fiber, and is also rarely cult. for ornament, especially in Fla. and S. Calif., and possibly in one or two northern conservatories. It has lvs. resembling the Smoke Tree, *Rhus Cotinus*, and bears long-stalked umbel-like heads of starry pink fls., with floral parts in 5's. The genus has half a dozen species, all from

S. Africa or Madagascar. Tender deciduous shrubs: lvs. opposite, often crowded at the ends of branches: fls. in terminal heads; perianth tube cylindrical, often curved; stamens 10, in a double series, the alternate ones shorter, upper or all exserted; style exserted. The plants are prop. by cuttings of half ripened wood.

672. Wild Aster, or Michaelmas Daisy. (×½.)

cotinifòlia, Linn. Lvs. opposite and alternate, oblong or obovate, acute at both ends: involucre a half shorter than the fls.: head about 15-fld.: fls. ½in. across; fragrant. South Africa. B. M. 147.

DAISY (i. e., *day's eye*, in allusion to the sun-like form of the flower). A name which properly belongs to the *Bellis perennis* of Europe, a low early-flowering composite, which, in its double forms (Fig. 669), is widely known as a garden plant (see *Bellis*). The American congener is *B. integrifolia*, Michx., an annual or biennial, very like the Old World species, ranging southwestward from Kentucky; it is not domesticated. In N. America, the word Daisy is applied to many field composites, particularly to those of comparatively low growth and large flower-heads. Unqualified, the word is commonly understood to mean *Chrysanthemum Leucanthemum* (Fig. 670), an Old World plant which has become an abundant field weed in the eastern part of the country. This plant is also commonly known as the Ox-Eye Daisy, although in parts of New England it is known as Whiteweed, and the term Ox-Eye is applied to *Rudbeckia hirta* (Fig. 671), which has a yellow-rayed head. Kin to the *Chrysanthemum Leucanthemum* are the Paris Daisies, or Marguerites, of the conservatories (see *Chrysanthemum*). The wild Asters (Fig. 672) are called Daisies, especially Michaelmas Daisies, in many parts of the country, particularly west of New York. Spring-flowering Erigerons also are called Daisies. The Swan River Daisy is *Brachycome iberidifolia* (Figs. 255, 256). The African Daisy is a species of Lonas. L. H. B.

DALBÉRGIA (N. Dalberg, a Swedish botanist, 1730 to 1820). *Leguminòsæ*. About 60 species of trees, shrubs, or climbers, belonging to tropical regions all over the world. One species only introduced to S. Calif., and most likely to prove of great interest as a timber tree. Experiments in Egypt have shown its most remarkable property of standing severe droughts, as well as submersion for a long period. Lvs. alternate, odd-pinnate, without stipules: fls. small, numerous, purple, violet or white, in forking cymes or irregular cyme-like panicles.

The Sissoo tree is worth trial in nearly frostless districts, especially along sandy river banks. It improves sterile lands. The wood is very elastic, seasons well, does not warp or split, is easily worked, and takes a fine polish. It is also a durable wood for boats. The tree is raised easily from seeds or cuttings, and is of quick growth. The demand is greater than the supply in India, and the tree is cult. for timber. (F. von Mueller, Extra Trop. Plants.) Other species of Dalbergia are of economic value.

Sissoo, Roxb. A good sized tree, 80 ft. high in India: lvs. pinnate; leaflets 5, alternate, stalked, obovate, abruptly acuminate, pubescent beneath: fls. white, in short, axillary panicles.—In India considered one of the best timbers, whenever elasticity and durability are required.

F. Franceschi and W. M.

DALECHÁMPIA (after the French savant, Dalechamps, 1513–1588). *Euphorbiàceæ*. This genus contains a tropical shrub rarely cultivated for its showy rose-red bracts. In 1867, Hooker said it was one of the noblest plants introduced for many years, comparable only with the Bougainvilleas, and surpassing them in size of bracts and brilliancy of color. It is presumably inferior to *Euphorbia pulcherrima* as a florists' plant, but is worth trial in the finer conservatories. The genus has about 50 species widely scattered in warm regions, shrubs, twiners or tall climbers, some of which have white bracts. Cult. in a warm house. Prop. by cuttings.

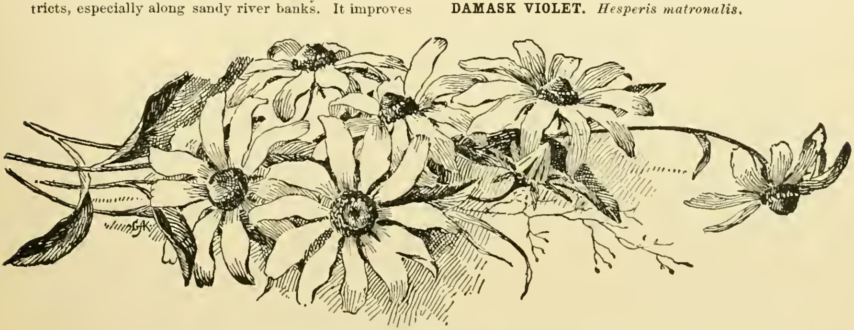
Roezliàna, Muell. Arg. Erect shrub, 3–4 ft. high, much branched, leafy: lvs. 6 in. long, sessile, obovate-lanceolate, acuminate, entire, or with coarse obtuse teeth above the middle, narrowed to a cordate base: bracts 2–2½ in. long, broadly heart-shaped, sessile, toothed, membranous, nerved, rose-red, with other smaller bracts: fls. small, yellow, clustered. Mex. B.M. 5640. Var. **álba**, Hort., has white bracts.

DALIBÁRDA (after Thomas Dalibard, French botanist). *Rosàceæ*. A low-growing, native, hardy herbaceous perennial plant, with foliage resembling a violet and fls. like those of a strawberry. It is a shy, modest plant, flowering from June to August in shady woods. It is rarely cultivated in alpine gardens and rockeries, being a slow-growing plant, liking a deep fibrous soil and a sheltered position. Prop. by cuttings. The genus has lately been referred to Rubus, but it differs utterly in habit, in the carpels being usually well defined instead of indefinite and the akenes dry instead of drupaceous.

rèpens, Linn. (*Rùbus Dalibárda*, Linn.). Fig. 673. Tufted, creeping: lvs. heart-shaped, wavy-toothed: fls. white, 1 or 2 on each scape; calyx 5–6-parted, 3 of the divisions larger and toothed; petals 5; stamens numerous; pistils 5–10. Common in northern woods. D. 85. In Fig. 673, *a* shows the perfect flower; *b*, *c*, akenes of the cleistogamous fls.

DAMASK ROSE. *Rosa Damascena.*

DAMASK VIOLET. *Hesperis matronalis.*


671. Yellow field Daisy, or Brown-eyed Susan—Rudbeckia hirta.

DAME'S ROCKET and **DAME'S VIOLET.** *Hesperis matronalis.*

DÁMMARA. See *Agathis.*

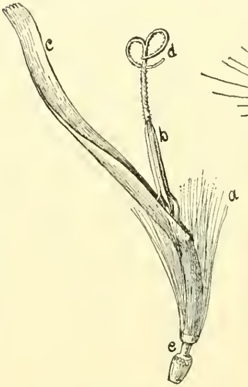
DAMNACÁNTHUS (Greek, *powerful spines*). *Rubiàceæ.* This monotypic genus contains a tender, evergreen, Japanese shrub, chiefly valued for its coral-red berries, which remain on the bush until the fls. of the next season are produced. Branches numerous, spiny: lvs. small, opposite, leathery, nearly sessile, broadly ovate, acuminate: fls. small, axillary, in 1's or 2's, white, fragrant; calyx tube obovoid, limb 4–5-cut; corolla funnel-shaped. Prop. by cuttings. This plant may be obtained from dealers in Japanese plants.

Índicus, Gærtn. (*D. màjor,* Sieb. & Zucc.). Described above. Himalayas and Jap.—Var. **submitis** is not so spiny.

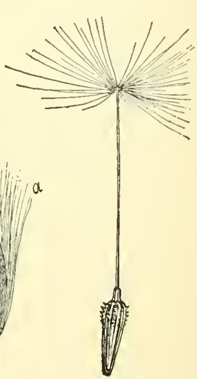
DAMPING-OFF. A gardeners' phrase for a disastrous rotting of plants, especially of seedlings and cuttings, and generally at the surface of the ground. It is usually associated with excessive moisture in the soil and air, with high and close temperatures, and sometimes poor light. Such conditions weaken the plants and allow them to fall a prey to the minute parasitic fungi which live upon the decaying vegetable matter in the soil, and can remain alive for months, even if the soil is thoroughly dry or frozen. As soon as the disease is noticed, the healthy plants should be removed to fresh soil, as the disease spreads rapidly. A whole bench of cuttings may be ruined in a night. The skillful propagator takes every possible precaution. His benches have perfect drainage, he uses fresh sharp sand, and sometimes sterilizes it with steam heat for several hours. Damping-off is one of the most trying experiences of the beginner, and nothing can prevent it but a thorough grasp of the principles of Greenhouse Management in general, and Watering in particular. (Consult articles on these subjects.) The terms Damping-off and Burning are also used for ruined flowers. Burning is often caused by sunlight or by imperfections in glass, but a flower spoiled by dripping cold water, or by some unknown cause, is said to have a burned look.

673. Dalibarda repens.
With perfect and cleistogamous flowers.

One of the commonest occasions of Damping-off is the sudden flooding of a bed or bench after leaving it too dry for a long time.



674. Floret of Dandelion; enlarged.



675. Mature fruit of Dandelion.

DAMSON. See *Plum.*

DANÆA (a personal name). *Marattiàceæ.* A small genus of fern-like plants, with synangia sessile, arranged in rows, and covering the entire under surface of the leaf. They are rarely seen in cultivation in Amer.

DANDELION (i. e., *dent de lion,* French for *lion's tooth;* referring to the teeth on the lvs.). The vernacular of *Taráxacum officinàle,* Weber, a stemless perennial or biennial plant of the *Compósitæ.* It is native to Europe and Asia, but is naturalized in all temperate countries. On the Rocky Mts. and in the high north are forms which are apparently indigenous. A floret from the head of a Dandelion is shown in Fig. 674. The ovary is at *e;* pappus (answering to calyx) at *a;* ray of corolla at *c;* ring of anthers at *b;* styles at *d.* The constricted part at *e* elongates in fruit, raising the pappus on a long stalk, as shown in Fig. 675; and thus is the balloon of the Dandelion formed. A Dandelion plant, with its scattering fruits, is shown in Fig. 676. There is another species of Dandelion in this country, but evidently not common. It is the Red-seeded Dandelion (***T. erythrospérmum,*** Andrz.), with red seeds, not reflexed involucral scales, and shorter beak.

The Dandelion is much prized for "greens." For this purpose it is cultivated in parts of Europe; also about Boston and in a few other localities in this country. There are several improved large-leaved varieties, mostly of French origin. Some of these named forms have beautiful curled lvs. Seeds are sown in the spring, and the crop is gathered the same fall or the following spring,—usually in the spring in this country. Commonly the seeds are sown where the plants are to stand, although the plantlets may be transplanted. The plants should stand about 1 foot apart each way, and a good crop will cover the land completely when a year old. Sandy or light loamy soil is preferred. The crop is harvested and marketed like spinach. The lvs. or heads are often blanched by tying them up, covering with sand or a flower-pot. The plants are sometimes grown more closely in beds, and frames are put over them to force them. Roots are sometimes removed from the field to the hotbed or house for forcing. When treated like chicory (which see), the roots will produce a winter salad very like *barbe de capucin.* Roots dug in fall and dried are sold for medicinal purposes in drug stores under the name of Taraxacum. L. H. B.

DANGLEBERRY or **BLUE TANGLEBERRY.** *Gaylussacia frondosa.*

DÁPHNE (Greek name of *Laurus nobilis*). *Thymelæàceæ.* Ornamental evergreen or deciduous shrubs, with handsome foliage and sweet-scented, white, purple, lilac or rarely greenish fls., which, in warmer climates, often appear during the winter. Lvs. alternate, rarely opposite, entire, short-petioled: fls. in clusters, short racemes or umbels, apetalous, mostly fragrant; perianth tubular or campanulate, 4-lobed, corolla-like, usually clothed with silky hairs outside; stamens 8, included; stigma capitate, sessile or nearly so: fr. a fleshy or leathery 1-seeded drupe. About 40 species in Eu. and Asia. Only *D. Mezereum*, with very early lilac, fragrant fls. and decorative scarlet fr., and some low evergreen species, like *D. Cneorum* and *D. Blagayana*, are hardy north, while most of the evergreen species can be recommended only for warmer climates. *D. Pontica* and *D. Laureola*, with large evergreen lvs., are hardy as far north as New York. Daphnes thrive best in a well drained, light soil and in a partly shaded position, but some, as *D. Cneorum* and *D. Blagayana*, which are exceedingly pretty plants for rockeries, do better in sunny situations. In the north, *D. odora* and its varieties are often grown in pots for their sweet-scented and handsome fls. appearing during the winter. A sandy compost of peat and loam in equal proportions will suit them; they require a good drainage and careful watering during the winter, and pots not larger than just necessary should be given; they may also be planted out in a cool greenhouse and trained as a wall plant. *D. Genkwa*, with abundant lilac fls. before the lvs., is sometimes forced. Prop. by seeds, sown after maturity or stratified, but germinating very slowly; also by layers put down in spring and taken off the following year. The evergreen species may be increased by cuttings of mature wood in fall under glass, and kept in a cool greenhouse during the winter. If gentle bottom heat can be given in early spring, it will be of advantage to the development of the roots; softwood cuttings taken from forced plants may also be used. *D. odora* is often veneer-grafted on seedling stock of *D. Laureola* in winter, or on roots of *D. Mezereum. D. Cneorum* and probably its allies are readily increased in spring by removing the earth around the plant, pegging down the branches and filling with fine compost almost to the tops of the branches. Next spring, if the compost is carefully removed, a large number of little buds, each supplied with a white root, are found along the branches; they are easily detached and planted in pans or boxes.

In California, according to Franceschi, the species most commonly grown is *D. odora*, the plants being mostly imported from Japan. Many plants are also sent from Japan for eastern greenhouse culture. A decoction of the bark of *D. Mezereum* is sold in drug stores under the name of Mezereum. It is stimulant and diuretic. It is also known as Olive Spurge. Alfred Rehder.

Although hardy Daphnes are generally recommended to be planted in partial shade, they invariably succeed in open, sunny places, and even in dry spots when the start is made with strong, well-rooted plants. They grow very freely in a light, open, well drained soil, enriched with thoroughly decayed manure. An annual top-dressing of the same material is of great benefit to the plants, young or old.

For propagation by cuttings, half-ripened wood is best. Layers should not be separated until early in the following spring, and it is advisable to shade the young plants in their new quarters for a few weeks until the roots have taken hold in the ground and growth has started. Cuttings should not be subjected to a very strong bottom heat before a good callus has formed, as they are slow to emit roots, and free growth can not be expected until the young plants attain the age of 2 years. The commonest of the hardy kinds is *D. Cneorum;* but *D. Blagayana*, which is still very rare in America, is a charming species, worthy of greater popularity. Grafts of this species are likely to die without apparent cause. *D. Neapolitana* needs a sheltered position. J. B. Keller.

Alphabetical list of species described below: D. autumnalis, 1; Blagayana, 5; *buxifolia*, 7; Cneorum, 4; *collina*, 6; *Dauphini*, 8; *Delphini*, 8; Fioniana, 7; *Fortunei*, 3; Genkwa, 3; Houtteana, 3; hybrida, 8; Indica, 9; *Japonica*, 9; *Jenkwa*, 3; Laureola, 10; Mazeli, 9; Mezereum, 1, 2; odora, 9; *odorata*, 9; oleoides, 7; Pontica, 10; sericea, 6; Van Houttei, 2.

A. *Lvs. deciduous: fls. axillary along the branches of the previous year, appearing before the lvs.*

1. **Mezèreum,** Linn. Erect shrub, with stout branches, to 4 ft.: lvs. alternate, cuneate, oblong or oblanceolate, glabrous, grayish beneath, 1–3 in. long: fls. usually 3, sessile, silky outside, fragrant, lilac-purple, appearing much before the lvs.: fr. roundish ovoid, scarlet. Feb.–Apr. Eu. to Altai and Caucasus. Gn. 29:550.—Var.

676. The Dandelion.

álba, Ait., has white fls. and yellow fr. Gn. 29:550. G.C. III. 21:183, 185. Var. **álba plèna**, Hort., has double white fls. Gn. 29:550. Var. **grandiflòra**, Hort. (var. *autumnàlis*, Hort.). With larger, very early fls., sometimes blooming in fall.

2. **Houtteàna**, Planch. (*D. Mezerèum*, var. *atropurpùrea*, Dipp.). Shrub, to 4 ft., with erect, stout branches: lvs. alternate, cuneate, oblong-lanceolate, glabrous, coriaceous and often persistent, purple: fls. appearing before the lvs., lilac-violet, 2–4, in short-peduncled clusters. Apr. F.S. 6:592.—Of garden origin, and probably hybrid between *D. Laureola* and *Mezereum*.

3. **Génkwa**, Sieb. & Zucc. (*D. Fórtunei*, Lindl. *D. Jénkwa*, Hort.). Shrub, to 3 ft., with slender branches: lvs. opposite, oblong-elliptic, appressed-pubescent on the veins beneath, 1¼–2 in. long: fls. lilac, 3–7, in short-stalked clusters, scentless, densely silky, villous outside. Mar., Apr. Jap. S.Z. 75. Gt. 15:499. F.S. 3:208. Gn. 42:868. R.B. 10:73.

AA. *Lvs. evergreen, alternate (see No. 2).*

B. *Fls. in terminal heads, rarely axillary and pinkish.*

C. *Habit low, procumbent or trailing.*

677. Daphne Cneorum.

4. **Cneòrum**, Linn. Fig. 677. With long, trailing, pubescent branches: lvs. crowded, cuneate, oblanceolate, mucronulate, finally glabrous, dark green and glossy above, glaucescent beneath, ½–1 in. long: fls. in sessile, many-fld. heads, pink, fragrant. Apr., May, and often again in summer. Mts. of M. Eu. B.M. 313. L. B. C. 18:1800. Gn. 45, p. 237.—Var. **màjus**, Hort. Of more vigorous growth. Gn. 51, p. 358. Var. *màximum* of European nurseries = *D. Neapolitana.*

5. **Blagayàna**, Freyer. Branches often ascending, glabrous: lvs. cuneate, obovate or oblong, glabrous, 1–1½ in. long: heads many-fld.: fls. white or yellowish white, fragrant, nearly glabrous outside, almost 1 in. long. Apr., May. Mts. of southeastern Eu. B.M. 7579. F.S. 22:2313. Gt. 29:1020. Gn. 14:143. G.C. II. 13:245; 17:505; III. 11:491.

CC. *Habit erect, 1–4 ft. high.*

D. *Perianth densely pubescent outside.*

6. **sericea**, Vahl (*D. collìna*, Sm.). Height 1–3 ft.: branches pubescent: lvs. cuneate, oblong or oblanceolate, obtuse, slightly revolute at the margin, glabrous and shining above, appressed-pubescent beneath, 1–1¾ in. long: fls. fragrant, in few-fld. heads, with bracts, purple, densely pubescent outside, with ovate-obtuse lobes, ¾ in. long. Spring. Italy to W. Asia. B.M. 428. B.R. 24:56. L.B.C. 14:1348.

7. **oleoides**, Schreb. (*D. buxifolia*, Vahl). Shrub, to 3 ft.: branches pubescent: lvs. obovate-elliptic to obovate-lanceolate, usually mucronulate or acute, villous-pubescent beneath, sometimes glabrous at length, 1–1½ in. long: fls. in few-fld. heads without bracts, white or pale lilac, with ovate-lanceolate, pointed lobes, ½ in. long. Southeastern Eu. L.B.C. 3:299. B.M. 1917.—Very variable in shape and pubescence of lvs. Var. **Fioniàna**, Hort., with obovate-lanceolate, obtuse lvs. and lilac fls., is said to be a hybrid between this species and the former.

8. **hýbrida**, Lindl. (*D. Daúphini*, Hort. *D. Délphini*, Lodd.). Garden hybrid of *D. collina* × *odora*. Similar to *D. odora*, but hardier. Erect shrub, to 4 ft.: lvs. cuneate, oblong-elliptic, dark green and shining above, glabrous or slightly hairy along the veins beneath when young, 2–3 in. long: fls. reddish purple, very fragrant, rather large, in few-fld. heads. B.R. 14:1177.

DD. *Perianth glabrous outside, or nearly so.*

9. **odòra**, Thunbg. (*D. Japónica*, Thunbg. *D. Índica*, Loisel., not Linn.). Shrub, to 4 ft., with glabrous branches: lvs. oblong-elliptic, acute at both ends, bluntly pointed, glabrous, 2–3 in. long: fls. in dense, terminal heads, very fragrant, white to purple: ovary glabrous. Winter and spring. China, Jap. Gn. 28:499. Gng. 2:211.—Var. **álba**, Hort. Fls. white. Gn. 28:499. Var. **Mazéli**, Hemsl. Fls. in peduncled, axillary clusters along the branches, pink outside, white within. Gn. 14:154. R.H. 1872:392. Hardier than the type. Var. **punctàta**, Hemsl. Fls. in dense heads, white, spotted outside with red. B.M. 1587. Var. **marginàta**, Hort. Lvs. bordered yellow: fls. red. P.M. 8:175. R.H. 1866:251. Var. **rùbra**, Don. Fls. purple. S.B.F.G. II. 4:320. G.C. III. 21:173. *D. odoràta*, Hort., is a common misprint in catalogues for *D. odora*. *D. odorata*, Lam.= *D. Cneorum*.

BB. *Fls. axillary, yellowish or greenish white, glabrous outside.*

10. **Laurèola**, Linn. Shrub, to 4 ft.: lvs. cuneate, obovate-lanceolate, acute, shining and dark green above, glabrous, 2–3½ in. long: fls. in 5–10-fld., nearly sessile racemes, yellowish green, scentless: fr. black. Mar.–May. S. Eu., W. Asia.—Var. *purpùrea* of the Kew Arboretum = *D. Houtteana*.

11. **Pòntica**, Linn. Shrub, to 5 ft.: lvs. cuneate, obovate or obovate-lanceolate, acute, shining, glabrous, 2–3 in. long: fls. in long-peduncled, 1–3-fld. clusters, greenish yellow, fragrant, with linear-lanceolate lobes. Apr., May. Southeastern Eu., W. Asia. B.M. 1282. G.C. II. 14:209.

D. alpìna, Linn. Erect shrub, to 2 ft.: lvs. deciduous, cuneate-lanceolate, sparingly silky: fls. white or blushed, terminal, fragrant. May, June. S. Eu. L.B.C. 1:66.—*D. Altàica*, Pall. Shrub, to 4 ft.: lvs. deciduous, cuneate, oblong-lanceolate, glabrous: fls. white, in terminal, 1–5-fld. heads, fragrant. May, June. Altai, Songaria, Mongolia. B.M. 1875. L.B.C. 4:399.—*D. australis*, Cyrill.=C. sericea.—*D. Caucàsica*, Pall. Allied to D. Altaica. Lvs. narrower: fls. in 3–20-fld. heads. Caucasus. B.M. 7388.—*D. Delahayàna*, Hort.=D. Neapolitana.—*D. glomeràta*, Lam. Allied to D. Pontica. Low: fls. light pink, fragrant, the clusters crowded at the end of the branches. May. W. Asia.—*D. Gnídium*, Linn. Evergreen shrub, to 2 ft.: lvs. linear-lanceolate, acute, glabrous: fls. yellowish white, fragrant, in terminal racemes or panicles. S. Eu. L.B.C. 2:150.—*D. Neapolitàna*, Lodd. (D. Cneorum × sericea). Evergreen shrub, to 2 ft.: lvs. cuneate-oblong, obtuse, nearly glabrous: fls. in terminal heads, rosy purple, fragrant. May, sometimes again in fall. L.B.C. 8:719.—*D. papyrífera*, Sieb.=Edgeworthia Gardneri.—*D. petræa*, Leyb. Dwarf evergreen shrub: lvs. linear-lanceolate, small, obtuse: fls. light pink, in terminal, 3–6-fld. heads, fragrant. June, July. S. Tyrol.—*D. rupéstris*, Facch.=petræa.—*D. salicifòlia*, Lam.=D. Caucasica.—*D. striàta*, Tratt. Dwarf evergreen shrub: lvs. small, cuneate, linear-lanceolate, glabrous: fls. in terminal, many-fld. heads, pink. June, July. Switzerland and Carpath. Mts.

ALFRED REHDER.

DAPHNÍDIUM. See *Benzoin*.

DAPHNIPHÝLLUM (Greek, literally a *laurel-leaf*). *Euphorbiàceæ*. A genus of oriental trees, perhaps 15 species. The following species are very rare in cultivation, and are obtained through dealers in Japanese plants. The genus has no near allies of horticultural value. Tropical glabrous trees: lvs. alternate, entire, stalked, leathery, usually narrow, feather-veined: racemes axillary, short: bracts minute or none: fls. stalked, diœcious, without petals: fr. an olive-shaped drupe.

macrópodum, Miq. Lvs. leathery; petiole 2 in. long; blade about 8 in. long, 2½ in. wide, elliptic-oblong, with a very short, hard, abrupt point: racemes of female fls. 3 in. long, slender; pedicels distant. Japan.

glaucéscens, Blume. Tree, often 20–30 ft. high, in India, Java and Corea; petiole three to four-fifths in. long in the pistillate plant; in the staminate 8–13 tenths of an inch long; lvs. obovate-lanceolate, rounded at the tip; blade 3–4 in. long, 12–16-tenths of an inch wide.—There is a variegated form.

W. M.

DARLINGTÒNIA (after William Darlington, the American botanist, to whom we are indebted for the delightful Memorials of Bartram and Marshall). *Sarraceniàceæ*. One of the most interesting and distinct of all pitcher plants. There is only one species in this genus. The plant was first collected near Mt. Shasta by the Wilkes Exploring Expedition. Indians attacked the party, and as the explorers retreated to their camp W. D. Brackenridge grabbed something, which turned out to be fragments of this exciting plant. The Darlingtonia grows at an altitude of 5,000 feet on the Sierra Nevadas of California, in sphagnum bogs along with sundews and rushes. The pitchers grow in clusters, and are a foot or two high. The pitcher is slender, erect, spirally twisted and rounded at the top, something like a fiddle head. From this hangs a curious reddish structure with two long flaps. Underneath the rounded top is seen the entrance to the trap, which means death to all sorts of insects, big and little. How the plant attracts them is not obvious, but the fate of the insects is clear. They climb down a long, narrow funnel, guided by needle-like downward-pointing hairs. Arrived at the bottom, the insects find these needles numerous and converging. As they attempt to escape they are confronted by an impassable array of lances. The manner of their death can be easily imagined. They sink into the bottom in a putrid, sticky mass, and the products of decomposition are presumably absorbed by the plant.

Darlingtonias have been grown outdoors in the east the year round in a few special localities. Edward Gillett, at Southwick, Mass., grows them in a favored spot without artificial protection. F. H. Horsford can preserve them at Charlotte, Vt., with the aid of a winter mulch.

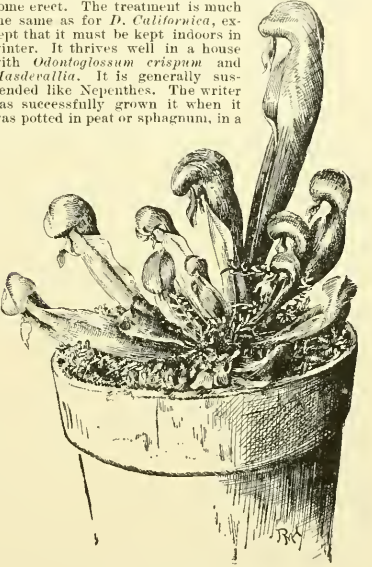
Califórnica, Torr. Fig. 678. Rootstock horizontal: lvs. forming pitchers as described above, which are curiously veined, and have a wing on the ventral surface and a crest on top, green, finally becoming a pear yellow: scape erect, ½–1½ ft. high, clothed with obtuse, erect, concave, half-clasping bracts: fls. solitary, nodding, 3 in. across; sepals 5, pale green; petals shorter than the sepals, about 1 in. long, converging, greenish yellow, with broad reddish brown veins, contracted above the middle; stigmas 5; ovary cylindrical below, dilated into a broad 5-lobed top with a deep depression in the center, 5-celled: seeds obovate-club-shaped. B.M. 5920. I.H. 18:75. F.S. 14:1440. G.C. III. 7:84, 85; 17:304; 24:339.—Int. to cult. about 1861. W. M.

As greenhouse plants, Darlingtonias require the same treatment as their allies, Sarracenias, Dioneas and Droseras. A well grown collection of these plants is not only very interesting and curious, but also very beautiful. To succeed, they must occupy a shaded position, and never be allowed to become dry. Give a cool, moist, even temperature. If possible a glass case should be provided for them, with provision made for ventilation; a constant moist atmosphere can be more easily maintained, and at the same time the greenhouse in which they are grown may be freely ventilated without injury to these plants. The material in which they grow best is two-thirds fern root fiber with the dust shaken out, and one-third chopped sphagnum moss and silver sand, with a few nodules of charcoal added. About the first week in July is perhaps the best time for potting, though one must be guided by the condition of the plants, choosing a time when they are the least active. When well established they will only require potting once in two years. The pots should be placed in pot saucers as a safeguard against their ever becoming dry, and all the space between the pots should be filled with sphagnum moss up to the rims of the pots. A temperature of 40° to 45° during winter, with a gradual rise as the days lengthen in spring, will suit them admirably. During the summer they should be kept well shaded, or they may be removed to a well shaded frame outside, in some secluded position free from hot, drying winds. Propagation of these plants is effected by division of the roots, or by seeds sown on live sphagnum moss in pans, the moss being made very even and the pans placed either under a bell jar or glass case in a cool, moist atmosphere. [For detailed English experience, see G.C. III. 24:338.]

Edward J. Canning.

Darlingtonia Courtii was named after William Court, for many years hybridizer and traveler for James Veitch & Son. Some say it is a hybrid between a Nepenthes and *Darlingtonia Californica*. Its lvs. or pitchers are shorter and stouter than those of *D. Californica*, and more rounded at the mouth. The stalks of the pitchers bend out almost horizontally from the base or crown of the plant and then become erect. The treatment is much the same as for *D. Californica*, except that it must be kept indoors in winter. It thrives well in a house with *Odontoglossum crispum* and *Masdevallia*. It is generally suspended like Nepenthes. The writer has successfully grown it when it was potted in peat or sphagnum, in a small pot which was inverted into a larger pot, with a layer of sphagnum packed in between, and the whole kept constantly moist. It is an interesting and attractive plant, and enjoys considerable popularity in England.

Henry A. Siebrecht.



678. Young leaves of Darlingtonia.

DARNEL. *Lolium perenne.*

DASYLÍRION (Greek, *tufted lily*). *Liliàceæ.* Highly ornamental plants, well adapted for rockeries, for isolated specimens on lawns, decoration of conservatories, staircases, etc., and eminently suitable for terraces and vases, in the formal style of gardening. Trunk short or missing altogether: lvs. in large number, inserted in a symmetrical way, so as to form a dome or globe-shaped, regular head, more or less serrulated, and in some species ending in a brush-like tuft of dried fibers. The tall panicles of numberless whitish green, minute flowers are also a striking feature. Dasylirions generally branch after blooming. They are of the easiest possible culture, and will stand some degrees of frost, particularly if kept dry. Easily propagated from seeds and from cuttings of the branches when produced, as they do not sucker as a rule. Six or perhaps more species altogether. Natives of the arid region comprising southwestern Texas, New Mexico, Arizona and northern Mexico. The following are grown in southern gardens and in conservatories up north, but not as much as they deserve.

F. Franceschi.

These plants are inferior to *Yucca filamentosa* in hardiness and in showiness and regularity of flowering, but they have an individuality of their own which should commend them to amateurs who like things that everybody doesn't have. They are especially esteemed in California, where the great flower-stalks, 8 or 10 ft. high, give a strong impression of the desert, which contrasts forcibly with civilized surroundings. The individual flowers are not highly colored, but the spikes are several feet long. Three plants sold as Dasylirions belong to Nolina, a closely related genus, which is chiefly distinguished by fruit characters. In Dasylirion the ovary has 3 ovules, and the fruit is dry and indehiscent, or splits through the partitions and between the cells. In Nolina the ovary has 2 ovules, and the fruit is dry, often 3-winged, and bursts in an irregular fashion. The latest monograph is in Latin by J. G. Baker in Journ. Linn. Soc. Vol. 18 (1881).

A. *Stems 4-angled, square in section.*

quadrangulàtum, S. Watson. Trunk 3 ft. high: lvs. drooping, dark green, 2 ft. or more long, 2–3 lines broad at the base, soon narrower and quadrangular, the margin rough but not toothed. Mex. Discovered in 1878.—This is the only species with entire, not toothed, leaf-margins. With Franceschi the trunk is so short as to be almost globular; the lvs. are 4–6 ft. long, slightly arching, and not splitting into fibers.

AA. *Stems not 4-angled.*

B. *Tips of lvs. not splitting into fibers.*

glaucophýllum, Hook. (*D. glaùcum*, Carr.). Recognized by the above character and by the very glaucous, bluish green lvs., of which the inner ones are strict and rigid, not gracefully drooping, the outer ones recurved, 2–3 ft. long, 8–9 lines wide above the base. Mex. B.M. 5041. R.H. 1872, p. 435. G.C. II. 13:205.

BB. *Tips of lvs. splitting into fibers.*

C. *Trunk long, 2–5 ft.*

D. *Teeth on the leaf-margins yellowish.*

Texànum, Scheele. Lvs. light green, 3–4 ft. long, 5–6 lines wide above the base; margin serrulate, armed with hooked teeth 1 line long and 3–6 lines apart; flower-stalk 8–10 ft. high. Tex. and New Mex.

DD. *Teeth on the leaf-margins brown.*

Wheèleri, S. Wats. Lvs. very similar to those of *D. Texanum*, 7–9 lines wide. The lvs. are shorter than in *D. glaucophyllum*, and they usually have a spiral twist, which gives the plant a remarkable appearance. Ariz and N. Mex.

CC. *Trunk short.*

D. *Racemes short, densely fld.*

E. *Length of lvs. 3–4 ft.*

graminifòlium, Zucc. Trunk very short: rosette of lvs. 4–5 ft. across: lvs. 3–7 lines wide above the base, tipped with 6–8 spreading fibers. Mex. Int. into cult. about 1835.—This name and *D. serratifolium* were given by Zuccarini without description, and are greatly confused in botanical literature and perhaps also in gardens.

EE. *Length of lvs. 2–3 ft.*

acrótrichum, Zucc. (*D. grácile*, Zucc.). Trunk in gardens unbranched, finally 4–5 ft. high: lvs. 6–8 lines wide, pale green, hardly glaucous, splitting at the tip into 20–30 fibers, the outer lvs. recurved. Mex. B.M. 5030. F.S. 14:1448. G.C. III. 19:204.

DD. *Racemes long, loosely fld.*

serratifòlium, Zucc. Lvs. exactly as in *D. acrotrichum*, 7–8 lines wide above the base. Mex.—Can be distinguished only in flower.

W. M.

DATE. A palm, *Phœnix dactylifera*, Linn., native to N. Africa and Arabia, and extensively planted in countries under Arabic control. It is also grown to some extent in southern Asia and southern Europe and in other tropical and subtropical countries. The pulpy fruits constitute one of the most important articles of food of the Arabs; and the leaves and other parts of the plant afford materials for dwellings and many domestic uses. Nearly all parts of the plant are utilized in some way. The Date palm reaches a height of 100 ft., making a straight, shaggy trunk, and it continues to bear for one or two centuries. It is diœcious. See *Phœnix*.

The Date palm has been grown in parts of the United States and adjacent Mexico for many years. In Florida, California, and restricted areas of a few other states, it has been grown for decorative purposes for more than a century. At the missions founded by the Spaniards at St. Augustine, and other places in Florida, and that long line of missions extending from far into Mexico, northward and westward through southern New Mexico, Arizona and California, it is probable that the Date was planted wherever the climatic conditions were favorable. Within the borders of the United States the greater number of these early plantings were in Florida or along the coast of southern California, regions where the sum total of summer heat is not sufficient to perfectly develop the Date fruit. The Date, as a fruit producer, being indigenous to a desert environment, does not take kindly to humid regions, even where it is not sufficiently cold to prohibit the growth of the tree. For this reason the greater number of the early plantings in this country matured little fruit, while that produced was of poor quality, although in many instances the trees grew luxuriantly and to large size. In the more arid portions of Lower California and Sonora, where there is sufficient water for irrigation, the early plantings have been continued down to the present time, and Dates of fair quality have been grown for many years. Moreover, each year the area devoted to Dates is increasing. Not only have sufficient Dates been grown in Sonora to supply the local markets and the markets of the larger cities, Hermosillo, Guaymas and Altar, but during the past year a surplus has been shipped from the state.

The part of the United States suitable for growing the Date tree, for the profitable production of fruit, is confined to rather narrow limits; viz., the irrigable portion of southern Arizona below an altitude of 2,500 feet and the somewhat similar area of southern California east of the coast ranges of mountains, where the summer temperature is not lowered by proximity to the sea. As a tree, however, it will make excellent growth over a much larger area, including the semi-arid regions of central and southern California. Over the larger area it will occasionally bloom and the earlier varieties mature fruit, but the summer heat will rarely be sufficient to bring it to a high degree of perfection. In recent years Dates have matured in favorable localities in California, in both the San Joaquin and Sacramento valleys, but it is only east of the mountains in the irrigable regions of the Mojave desert that there is sufficient summer heat to mature an annual crop. In the strictly desert regions of southern Arizona and southeastern California the planting of seedling Dates is rapidly increasing, and the time is not far distant when in this region not a little attention will be given to the production of this fruit. Among the older trees may be mentioned those on a ranch owned by Hall Hanlon, situated on the California side of the Colorado river a few miles below Yuma. In 1875 Mr. Hanlon received a box of Dates from La Paz, Lower California, which were grown at that place, and planted the seed the same year. From these seeds 12 pistillate and several staminate trees were raised, the trees beginning to bloom at the age of 5 years. All the pistillate trees have fruited abundantly each year since 7 years of age, and now vary in height from 20 to 50 feet, each tree producing yearly from 6 to 17 bunches of fruit, the bunches varying in weight from 20 to 38 pounds.

In recent years many seedling palms have come into bearing in southern Arizona, particularly in Salt river valley. On the Bartlett, Adams & Co's. ranch at Glendale, several seedling Dates were in bearing in the fall of 1898, at which time one tree, 8 years from seed, bore an estimated crop of more than 400 pounds. On a ranch owned by E. L. Arthur, in the vicinity of Tempe, a dozen or more palms were in bearing the same year, several of which bore one or more bunches of fruit the fourth year after planting. In addition to those cited above, many seedling palms bore during the fall of 1898 at Phœnix, Tempe, Glendale, Mesa, Arizola, Florence, Yuma, Tucson, and other points in southern Arizona, and a number of localities in California.

An impetus was given to Date culture in this country by the importation by the U. S. Department of Agriculture, in the spring of 1891 and 1892, of 74 rooted suckers, 68 of which were supposed to have been taken from female trees of approved varieties, while the remaining six were labeled male. These trees were distributed to various points in New Mexico, Arizona and California. Those planted on the Experiment Station farm at Phœnix have made a much better growth and bloomed more freely than the plants sent elsewhere, some of the specimens at this Station, in the fall of 1898, measuring more than 20 feet to the topmost leaf and producing 100 to 200 pounds of fruit to the tree. A sufficient number of the imported palms have blossomed to indicate that they are not true to name, more than one-half of those blossoming to date being staminate, while those that have fruited are inferior to a number of the choicer seedlings grown in Arizona. It yet remains for another importation to be made, when greater care may be taken that the imported plants are suckers from trees of recognized merit and approved varieties.

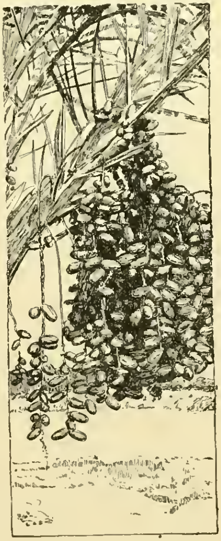
679. An American seedling Date.

An examination of specimens of fruit from many of the seedling Dates grown in the United States, as well as in the state of Sonora, Mexico, during the season of 1898, and also an examination of the fruit of the imported Dates at the Experiment Station farm at Phœnix, showed considerable variation in the size, flavor, shape, color, and general desirability of the different specimens. Only about 50 per cent of the trees examined bore edible Dates, the remainder being astringent even when fully ripe, and little more than a skin over a pit. Of the remaining 50 per cent only about one-fifth were especially desirable and worthy of perpetuating by growing suckers. It must be remembered in this connection that Dates, like most other fruits, do not come true to seed; hence, it is not reasonable to expect a very large percentage of desirable Dates as a result of growing seedlings. Some of the best seedling Dates grown in Arizona in 1898 were light in color and varied in weight from two-sevenths to one-fourth ounce to the specimen, with from 10 to 11 parts in weight of flesh (mesocarp) to one part of pit. The largest of the imported Dates; viz., the variety labelled "Seewah," produced Dates averaging nearly one-third ounce to the specimen. Although this is the largest Date yet produced in Arizona, and probably in the United States, the pit is extremely large, there being but 8 parts of flesh to one of pit. Furthermore, the flesh is covered with a thick skin (epicarp), and there is a firm papery covering (endocarp) over the pit. An excessive development of either epicarp or endocarp is undesirable. Choice varieties of Dates should have thin skins and small seeds surrounded by a thin, papery covering. The flesh should be thick, of medium firmness, sweet, and of agreeable flavor. The Date industry in the United States is in its infancy. Approved varieties have not as yet been introduced and the quantity of fruit produced has not reached sufficient magnitude to give it a commercial rating.

The Date palm grows upon nearly all kinds of soil. If it be sufficiently irrigated and has the requisite amount of heat, the soil seems to be a secondary consideration. In general it may be said, however, that lean, sandy soils of the desert, with a small percentage of clay and charged with alkaline salts, are preferable to rich and heavy soils, suitable for growing ordinary crops. The question of water is of great importance in the culture of Dates, as it is necessary that the roots of the Date palm be in moist earth throughout the year. In general, the amount of water required for successful culture is considerable. If sufficient water cannot be supplied by natural methods, we must resort to irrigation. Water should be supplied at frequent intervals throughout the year. However, the most should be supplied in the spring before blooming, and in the fall prior to the ripening of the fruit. The amount of water for each palm depends so much upon soil and local conditions that an estimate would be worthless. Care should be taken not to irrigate to excess at the time of blooming and immediately after, as it will militate against the successful setting of the fruit. The Date seems not only to enjoy a high atmospheric temperature, but a high temperature of the water supplied in irrigation as well. In irrigating small crops by flooding, it is necessary in midsummer to irrigate late in the afternoon or at night in order to prevent scalding. Care should be taken, during the warmer portion of the year, that the Date palm is not subjected to hot water about the roots, rising above the soil for a considerable length of time, and later left until the soil becomes exceedingly dry and baked by the sun. Such extremes may sometimes seriously injure or destroy the tree.

Dates are propagated either by seeds or suckers. As with the apple and most other fruits, Dates do not come true to seed, hence the only sure way to obtain good Dates is to secure a sucker from a tree of established excellence. Propagation from seed is of little value when we desire to obtain Dates of the same quality as those from which the seeds were obtained, or when we wish a correct proportion of male to female trees. Again, seedling palms are usually very much later in maturing their fruit, and generally the fruit from such trees have large seeds and little flesh. It is always preferable to propagate Dates from suckers unless one desires to originate new varieties, not only on account of the knowledge of the sex (it being hardly necessary to state that the sex of a sucker is the same as that of the plant from which it is taken), but on account of the ability to make a selection in the variety and quality of the fruit.

All species belonging to the genus Phœnix are difficult to transplant with uniform success. Frequently as high as 50 per cent of transplanted Dates die even when watered daily and given the best of care. In planting suckers, with the best of attention, a large percentage die; while without care not one in a hundred will grow. It is due not so much to the lack of experience in removing the suckers as to lack of proper care after removal, that so large a percentage fail to grow. Suckers may be removed at any time during the spring or early summer, or even in the winter, if proper care be given them after removal. If they are to be planted in the open ground it is advisable to remove them during the spring or early summer, April probably being the best month. In winter, when the plants are at a standstill, the suckers may be removed with comparatively small loss, if the bulbs be not less than 4 inches in diameter and have a few roots. It is necessary, when suckers are removed at this season, to set them in rather small pots, so that the earth, which should be given a daily soaking, may have a chance to get warm quickly. The pots should be kept in a greenhouse, or, better yet, imbedded in a hotbed of manure, covered with the customary frame and glass. In all cases the leaves should be cut back to 6 to 12 inches in length. If proper attention can be given it is best to plant the suckers where



680. Fruit clusters of Date, as grown in Arizona.

they are to remain, as a second chance for loss occurs when they are planted in a nursery and later moved to the position that they are finally to occupy. A 2-inch chisel, well sharpened, and an appropriate mallet are the important tools to use in removing suckers. The leafstalks should be cut away, exposing the bulb of the sucker, care being taken not to injure the bulb in removing. One should cut in rather deeply at either side, not being afraid of injuring the old plant, cutting out a V-shaped portion extending from the base of the bulb downward for a foot or more, and being careful to secure in uninjured condition all the attached roots. If the position of the sucker be not too high above the ground the V-shaped portion should be continued downward into the soil, that all established roots be obtained.

Under proper cultivation the Date palm should produce from 10 to 14 leaves each year. A well developed tree will have at one time from 30 to 60 leaves, the old ones dying away below while new ones are forming at the top. The different varieties show great variation in rapidity of growth, form and length of leaves, size of stem, and general aspect of plant. The stem of the Date palm is very elastic, and when it reaches a height of 10 or more feet it is frequently necessary to tie the growing bunches of Dates securely to the lower leafstalks, that they be not broken and injured by the wind before maturity.

For further information, consult Bull. 29, Arizona Exp. Sta. J. W. Toumey.

A successful method of propagation of Date trees is to bank up earth about the base of the parent tree and above the base of the suckers, and keep moist by watering daily to induce formation of roots. Suckers may be partially severed from the old stock before the banking is done, or after the roots have started. When the roots are well grown, the suckers may be transplanted with little loss.

For purposes of pollination the Arabs usually plant about one male tree to 25 female or fruit-bearing trees. In order to secure perfect pollination, they cut sprays of male blossoms, when the pollen is in the best condition, and tie them to the leaf-stems above the pistillate flowers at the time they are opening. If this were done in cases where isolated female Date trees are growing in America, there would be much perfect and delicious fruit where now there is that which is worthless, because of the lack of pollination.

In the earlier importations the agents were imposed upon by either ignorant or designing natives of Egypt, by sending seedlings instead of rooted suckers, which were specifically ordered. The varieties from Algeria and Arabia were suckers from the best varieties, but unfortunately, most of them have died. At least two are yet living at the California Experiment Station at Tulare. This year, 1899, the Department of Agriculture at Washington has succeeded in importing, through a special agent sent to Algeria, a number of suckers from the best bearing trees in that country, and further efforts are being made to secure more plants from there, and from other famous Date-growing countries.

H. E. Van Deman.

DATE PLUM. Another name of Persimmon.

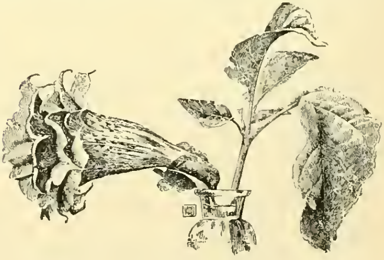
DATÙRA (Arabic name). Includes *Brugmansia. Solanàceæ.* This genus contains the widespread Jamestown Weed and several plants cultivated for their huge trumpet-like flowers, which have an odor that is very pleasant to some. The genus has perhaps 25 species, widely dispersed in warm and temperate regions. Herbs, shrubs and trees: lvs. large, entire or wavy-toothed: fls. large, solitary, erect or pendulous, mostly white, with more or less violet, rarely red or yellow: fr. spiny. The most popular kind in northern gardens is commonly called *D. cornucopia* (Fig. 681), which is especially interesting when its flowers develop 2 or 3 well-defined trumpets, one within another. Sometimes, however, these double flowers are a confused mass of petalage. Double and triple forms are likely to occur in any of the species described below. The Horn of Plenty, *D. cornucopia*, has been especially popular in America since about 1895, when it was found in South America by an orchid collector of the United States Nursery Company, and soon became widely distributed in "yellow, white, blue and deep carmine," all double forms. The "yellow" was probably a dull, creamy shade, and the "blue," a violet. The disseminators assert that seeds started in January, February or March will produce 200-300 fragrant flowers in a season.

Daturas contain strong narcotics. Large doses are poisonous, small doses medicinal. Separate preparations of Stramonium seed and leaves are commonly sold in the drug stores. *D. Stramonium* (Fig. 682) is the Thorn Apple or Jamestown Weed, the latter name being corrupted into Jimpson Weed. Its foul, rank herbage and large spiny fruits are often seen in rubbish heaps. At the first successful settlement in America—Jamestown, Va., 1607—it is said that the men ate these thorn apples with curious results. Capt. John Smith's account of their mad antics is very entertaining. It has been conjectured that this same plant was used by the priests at Delphi to produce oracular ravings. The seeds of *D. sanguinea* are said to have been used by Peruvian priests that were believed to have prophetic power. The Arabs of central Africa are said to smoke parts of the dried plant for asthma and influenza.

Daturas are of easy culture. Some are treated as tender annuals. In the north the woody species can be grown outdoors in summer, and stored in cellars during the winter; in the south and in S. California they are almost everblooming. Daturas are sometimes kept in cool conservatories the year round, in which case they should be planted in the border, as Daturas rarely flower well in pots, their roots being large and spreading and requiring a constant supply of moisture. This method produces great quantities of bloom in spring. After flowering, the plants should be cut in to the main limbs, or a very straggling and unsightly growth will result.

A. *Flowers red.*

sanguínea, Ruiz. & Pav. Tree-like shrub, 4–12 ft. high: branches fragile, leafy at the apex: lvs. clustered, 5–7 from the same point, ovate-lanceolate, acuminate, almost 7 in. long, 2½–2¾ in. wide, pubescent on both sides, shining green above, paler beneath, the lower lvs. wavy or angled, upper one entire; petioles 2½ in. long, channeled, pubescent: peduncles terminal: fls. pendulous, brilliant orange red, about 8 in. long; calyx ovate, 5-angled, variegated, inflated. Peru. B.R. 20:1739. F.S. 18:1883.—Franceschi says it is more erect-growing than *D. cornigera* and *D. suaveolens*, with smaller, less open and not fragrant fls. All the other species are said to be easily raised from cuttings, but this is very slow to take root.



681. A triple form of Datura fastuosa, commonly known as D. cornucopia.

AA. *Flowers yellow.*

chlorántha, Hook. Shrub, glabrous throughout: lvs. broadly ovate, almost triangular; margin wavy, with short, rather sharp, very distinct teeth: peduncles axillary, very short: fls. pendulous, yellow; calyx tubular, with 5 nearly uniform, short, triangular teeth. Habitat unknown. B.M. 5128. Gn. 46: 988 and 49, p. 379.—Datura "Golden Queen" is presumably a horticultural variety of this species. While this species is horticurally distinct by reason of its yellow fls., it is a very doubtful species botanically, being founded on a very double garden form of unknown origin. In Vilmorin's Blumengärtnerei it is referred to *D. humilis*, Desf., but *D. humilis*, according to Index Kewensis, is to be referred to *D. fastuosa*.

682. Pods of Datura Stramonium (× ⅓).

AA. *Fls. white, sometimes touched with violet.*

B. *Plants tall, 7–15 ft. high: blossoms pendulous.*

C. *Calyx tubular, with 5 obscure teeth.*

suavèolens, Humb. & Bonpl. (*D. Gárdneri*, Hook.). ANGEL'S TRUMPET. This is the plant which is usually cultivated as *D. arborea*. It is said to be very distinct from the true *D. arborea* of Linn., but it can be separated with certainty only by the calyx. Tree-like shrub, 10–15 ft. high: lvs. ovate oblong, 6–12 in. long, 2¼–4 in. wide, entire, glabrous, petioled, often unequal at the base: fls. 9–12 in. long; calyx inflated, angled, glabrous, with 5 obscure teeth; corolla tube plaited, the limb with 5 short lobes; anthers crowded together. Mex. G.C. III. 11: 593; 23: 71. S.H. 2: 433.—Franceschi says it resembles *D. cornigera* in habit and fls., but the lvs. and stems are almost glabrous, and the calyx lacks the characteristic spur-like appendage of *D. cornigera*. The double form is much commoner in the gardens than the single.

CC. *Calyx spathe-like, not toothed.*

arbòrea, Linn. (*Brugmánsia arbòrea*, Steud.). ANGEL'S TRUMPET. Small tree: lvs. ovate-lanceolate, margin entire, never wavy or angled, pubescent, in pairs, one a third shorter than the other; petioles 1 in. or more long: fls. with a musk-like odor; calyx tubular, entire, spathe-like, acuminate; corolla tube terete, the lobes of the limb very long; anthers distinct, not conglomerate. Peru and Chile. G.C. II. 11: 141.—Most of the plants cult. under this name are presumably *D. suaveolens*. The extent to which the true *D. arborea* is cultivated is undetermined.

BB. *Plants less tall, only 2–5 ft high.*

C. *Blossoms erect: calyx not spurred.*

D. *Corolla 5-toothed.*

fastuòsa, Linn. (*D.* and *B. cornucòpia*, Hort.). Fig. 681. Annual, 4–5 ft. high, herbaceous: lvs. ovate-lanceolate, acuminate, acute and unequal at the base, toothed or wavy, glabrous on both sides, solitary, upper ones in pairs, one of which is larger, 7–8 in. long, 2½–3½ in. wide; petioles 1½–2½ in. long: fls. 6½–7 in. long, violet outside, whitish within; calyx purple, angled, 2 in. long, 5-toothed, the teeth triangular lanceolate, acuminate, 5 lines long, 2–3 lines wide. Native of India. Naturalized in the tropics of both worlds. F.S. 14: 1457. Gn. 46: 978 and I.H. 42: 25.—There is a variety **Huberiàna**. This is the commonest of all Daturas in eastern gardens.

DD. *Corolla 10-toothed.*

meteloides, DC. (*D. Wrightii*, Hort.). Perennial (cult. as an annual north): branches slender, forked: lvs. ovate oblong, almost entire, acuminate, acute at both ends, not cordate or angled, upper leaves often in pairs, the larger 2–2¼ in. long, 8–9 lines wide; petioles thickened at the base, 4–5 lines wide: calyx tubular, the teeth large, 5–10 in. long, very acute, unequal; corolla about 4–8 in. long, or twice as long as the calyx, 10-toothed, the teeth short. California. Gt. 1859: 260. R.H. 1857, p. 571.—Misspelled *metalioides*, etc. The name means "like D. Metel" which is a common plant in S. Europe. "*D. meteloides* is a perennial, spreading over the ground in large clumps: lvs. greyish dull green color: fls. standing erect, white, delicately tinged with light violet-purple, not quite as fragrant as *D. suaveolens*. This can be grown also as an annual, easily blooming the first year from seed. The common statements that this plant is an annual are incorrect."—*Franceschi.*

CC. *Blossoms pendulous: calyx with a long spur.*

cornígera, Hook. (*D.* and *B. Knightii*, Hort.). Height 3–4 ft., branches downy: lvs. chiefly at the ends of branches, ovate, petioled, acuminate, margin entire, wavy or angled: fls. pendulous, white or creamy white, very fragrant at night, striated, 5-lobed, the lobes terminated by a long awl-shaped spreading or recurved point; stamens included. Mex. B.M. 4252. *B. Knightii* seems to be only a trade name for the double form. Gn. 45: p. 549.—Cornigera means horned or spurred, referring to the character of the calyx, which easily separates this species. "This and *D. suaveolens* are known as 'Floripondio' to the Spanish-Americans, perhaps no other plant being more popular with them."—*F. Franceschi.*

W. M.

DAUCUS (ancient Greek name). *Umbelliferæ.* Perhaps 25 annual and biennial herbs of very wide distribution. One or 2 species are native to N. Amer., and the wild Carrot is an abundant old-field weed in the northeastern states. See *Carrot.*

DAVÁLLIA (a personal name). *Polypodiàceæ.* A large genus of mostly tropical ferns, usually with firm, somewhat finely divided foliage and coriaceous semicylindric indusia, which are attached at both the base and sides. Some of the smaller species are largely used for hanging baskets. For *D. concinna* and *D. fæniculacea*, see *Loxoscaphe*; *D. parvula*, see *Leucostegia*: *D. platyphylla*, see *Microlepia*; *D. stricta*, see *Stenoloma*; *D. tenuifolia*, see *Stenoloma*; *D. Tyermanni*, see *Humata*.

L. M. UNDERWOOD.

The diverse habits of growth of the many different species of Davallias, and their good lasting qualities, peculiarly fit them under ordinary care for decorative purposes, where delicate and graceful plants are desired. Among the many species, the following are most often seen and best adapted for commercial purposes: *D. bullata*, *D. parvula*, very dwarf; *D. pentaphylla*, young fronds of a dark bronzy green, and *D. Tyermanni*, are well adapted for hanging baskets. *D. dissecta* and var. *elegans*, *D. concinna*, *D. Fijiensis* and vars. *plumosa* and *majus*, *D. fæniculacea*, *D. solida*, *D. pallida* (syn., *Mooreana*) and *D. pyxidata* are adapted for large specimen plants. *D. tenuifolia* and vars. *stricta* and *Veitchiana* are desirable for fern dishes, because of their dwarfish habit of growth and the ease with which they may be raised from spores.

Old plants of Davallia may be cut into a number of smaller ones with a sharp knife. Planted firmly into shallow pans and placed in a temperature of 60–65° F., they soon develop into symmetrical plants. The rhizomes should be firmly fastened to soil by strong copper-wire staples, where they will root in a short time. To gain a large number of small plants, the rhizomes should be detached, cleaned from all soil and roots, laid on sand and thinly covered with moss. Placed in a shaded position in a temperature of 65–70° and kept moderately moist, a number of small plants will develop from the dormant eyes, which may be separately potted as soon as of sufficient size. Spores of Davallia should be sown on a fine compost of soil, leaf-mold or peat and sand in equal parts, and placed in a shaded position in a temperature of 60–65° F. All the operations of propagation of Davallias will be most successful if carried on during the spring months. All Davallias delight in a rich and open compost, an abundance of light and air, and moisture at their roots, a temperature of 60–65° F. and a thorough syringing every bright day. N. N. Bruckner.

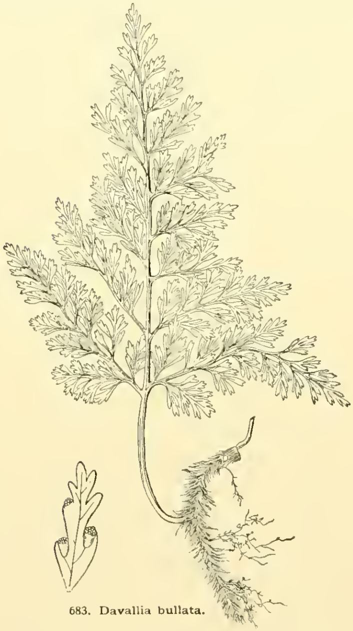
A. *Lvs. once pinnate, with few linear segments.*

pentaphýlla, Blume. Lvs. scattered from a stout fibrillose rootstock, with 1 terminal and 4–6 lateral pinnæ, 4–6 in. long, ½in. broad; sori in marginal rows. Java and Polynesia.

AA. *Lvs. tri-quadri-pinnatifid, deltoid.*

B. *Length of lvs. usually less than 1 ft.*

bullàta, Wall. Fig. 683. Lvs. scattered from a creeping rootstock, which is clothed with light brown fibrillose scales, often whitish when young; 8–10 in. long, 4–6 in. wide, quadri-pinnatifid, with deeply incised segments; texture firm. India to Java and Japan. F.E. 11:543.



683. Davallia bullata.

Màriesii, Moore. Rootstock stout, with brownish scales, which are lanceolate from a broad dilated base: lvs. deltoid, 4–6 in. each way, with the pinnæ cut away at the lower side at base; segments short-linear, 1-nerved; sori intramarginal. Japan. G.C. III. 13:571.

BB. *Length of lvs. 1–2 ft.*

C. *Foliage commonly tri-pinnatifid.*

élegans, Swz. Rootstock clothed with woolly fibers: lvs. 9–15 in. wide, with the main rachis slightly winged toward the apex; indusia several to a segment, with the sharp teeth projecting beyond the cups. Ceylon to Australia and Polynesia.

sólida, Swz. (*D. ornàta*, Wall.). Rootstock clothed with appressed scales or fibers: lvs. 1–2 ft. long, 12–15 in. wide, the center of the apex broad and undivided; segments broad and slightly cut; indusia marginal. Malaya.

CC. *Foliage commonly quadri-pinnatifid.*

pyxidàta, Cav. Rootstock clothed with pale brown linear scales: lvs. tri-quadri-pinnatifid, 6–9 in. broad, with oblong segments; sori with a broad space outside, which is extended into a horn-like projection. Australia.

Fijiénsis, Hook. Lvs. 6–12 in. broad, with the lower pinnæ deltoid and the segments cut into narrow, linear divisions ⅛–¼in. long; sori on the dilated apices of the segments, with no horn. Fiji Islands. A.F. 6:900; 9:233. G.C. III. 23:323.—One of the finest species, with numerous varieties.

disséeta, J. Sm. Rootstock stout, with dense, rusty scales: lvs. 10–12 in. broad, on straw-colored stalks; segments oblong, cuneate at base, with simple or bifid lobes; sori minute, often with two projecting horns. Java.

BBB. *Length of lvs. 2–3 ft.*

divaricàta, Blume (*D. polyántha*, Hook.). Rootstock with linear rusty scales: lvs. tri-pinnatifid, sometimes 2 ft. broad, with deltoid segments cut into linear oblong lobes; sori at some distance from the edge. India to Java and Hong Kong.

pállida, Mett. (*D. Mooreàna*, Masters). Rootstock stout, with lanceolate dark brown scales: lvs. with straw-colored stalks 12–18 in. long, quadri-pinnatifid, with deltoid, stalked segments, the ultimate obovate-cuneate, bearing the sorus on the upper side at the base. Aneiteum and Borneo. A.F. 6:901; 9:231. A.G. 13:143.

L. M. Underwood.

DAY FLOWER. See *Commelina.*

DAY LILY. *Funkia* and *Hemerocallis.*

DEAD NETTLE. *Lamium.*

DEANE, REV. SAMUEL, poet and agricultural writer, was born at Dedham, Mass., July 30, 1733, and died at Falmouth (now Portland), Maine, Nov. 12, 1814, where he had been pastor since Oct. 17, 1764. While vice-president of Bowdoin College, he published, in 1790, his "New England Farmer, or Georgical Dictionary," the first American encyclopedic work on agriculture. This had a much wider circulation, probably, than Jared Eliot's "Essays upon Field-Husbandry," 1747. Its influence may be traced to the middle of the present century. Deane's work was freely quoted by F. G. Fessenden until his death, in 1837. The second edition, 1797, was entitled The Georgical Dictionary. A third edition was published in 1822.

Deane and Eliot were the chief writers in that early stage of American horticulture when it was hardly important enough to be considered distinct from general agriculture. For biographical details, see Drake's Dictionary of American Biography.

DEARBORN, HENRY ALEXANDER SCAMMELL, soldier, statesman and author (1783–1851), was also an ardent horticulturist. He was a moving spirit in the organization of the Massachusetts Horticultural Society, and was elected its first president on the 17th of March, 1829. He was partly instrumental in the establishment of an "experimental garden and cemetery at Mount Auburn," the parent of rural cemeteries. The plan of the cemetery was largely his (cf. *Bigelow*). He "devoted himself to this work most assiduously," writes the chronicler of the society, "spending the greater part of the autumn [1831] at Mount Auburn, in laboring with hands as well as mind, without money and without price." The Abbe Berlese's Monography of the Camellia was translated by him, and published in Boston in 1838. He also translated from the French, in 1830, an account of the since famous *Morus multicaulis.* He left MS. writings on horticulture. For notes on his horticultural labors, see "History of the Mass. Horticultural Society," 1880, which contains a portrait; also John B. Russel in Tilton's Journ. Hort. 7:88, 157, 276. Gen. H. A. S. Dearborn was son of Gen. Henry Dearborn, of Revolution and later fame. L. H. B.

DÉCODON (Greek, *ten-toothed*). *Lythràceæ.* A hardy perennial herb rarely cultivated by dealers in native plants. It has opposite or whorled lvs., the upper with axillary, short-stalked clusters of fls. Abroad Decodon is usually considered a subgenus of Nesæa. It is distinguished from Lythrum by having 5 (rarely 4) petals instead of 6, and 8–10 stamens, while Lythrum has mostly 6 or 12.

verticillàtus, Ell. (*Nesæa verticillàta*, HBK.). Swamp Loose-Strife. Smooth or downy: stems recurved, 2–8 ft. long, 4–6-sided: lvs. lanceolate, nearly sessile: petals 5, cuneate-lanceolate, rose-purple, ½ in. long; stamens 10, half of them shorter. Swampy grounds, N. E. to Fla., west to Minn. and La.—Int. by H. P. Kelsey.

DECUMÀRIA (Latin, *decumus*, tenth, referring to the number of the parts of the fl.). *Saxifragàceæ.* Shrubs climbing by aërial rootlets: lvs. deciduous, opposite, petioled: fls. in terminal peduncled corymbs, small, white, perfect; sepals and petals 7–10; stamens 20–30: fr. a 5–10-celled ribbed capsule opening between the ribs, with numerous minute seeds. Two species in E. N. Amer. and China, of which only the American species is in cultivation. Ornamental climbing shrub, with handsome glossy foliage and fragrant white fls., forming a corymb of feathery appearance, well adapted for covering walls, rocks, trellis work and trunks of trees, but not hardy north. Thrives in almost any humid soil. Prop. by greenwood cuttings in summer under glass, rarely by seeds.

bárbara, Linn. (*D. sarmentòsa*, Bosc). Climbing to 30 ft., but usually less high: lvs. ovate, obtuse or acute, remotely denticulate or entire, glabrous and shining above, 2–4 in. long: corymbs 2–3 in. broad, semiglobose. May, June. Va. to Fla., west to La. B.B. 2:185. Mn. 1:41.

Alfred Rehder.

DEERBERRY. *Vaccinium stamineum.*

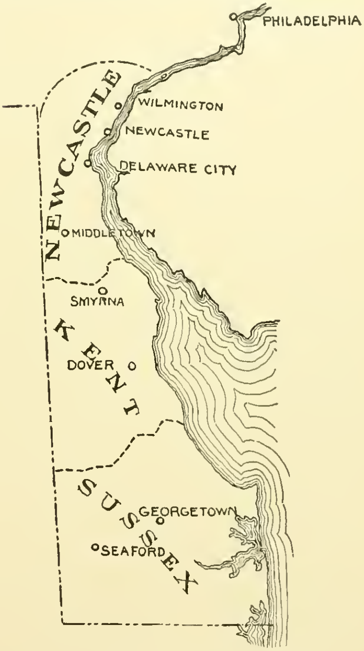
DEERGRASS. *Rhexia.*

DELÁRBREA (after a French naturalist). *Araliàceæ.* A genus of two species of tall, tender shrubs from New Caledonia, distinguished from Aralia by the fruits. Culture same as Aralia.

spectábilis, Linden & And. (*Aràlia concínna*, Nicholson). Stem ashy grey, with brown, warty spots: lvs. odd-pinnate, lfts. in 8–10 pairs, each lft. 3-toothed or twice cut, sometimes so deeply cut as to make 3 entirely free segments. New Caledonia. I.H. 25:314.—Under the name of *Aralia spectabilis*, two different plants have been sold. The English dealer Bull's plant was *Aralia filicifolia*. The Belgian dealer Linden's plant was *Delarbrea spectabilis*. (See I.H. 23, p. 72. G.C. II. 5:603.) The two plants can be distinguished at a glance. The primary division of the leaf in *A. filicifolia* is long and narrow, thrice as long as in *D. spectabilis*, and tapering to a long point, while in *D. spectabilis* the primary division of the leaf is short and has 3 well-marked segments. In *A. filicifolia* the secondary divisions are deeply and irregularly cut; in *D. spectabilis* they are merely serrate. The two plants are also immediately distinguished by the spots on the stem.

DELAWARE, HORTICULTURE IN. The state of Delaware (Fig. 684) is situated close to the largest fruit-consuming cities of the New World. An emphatic commercial advantage in the development of a diversified horticulture arises from the modifying climatic influence of the Delaware and Chesapeake bays; from a variety of fertile soils; and from the ripening of its fruits and vegetables between the products of the North and South. There is probably no area in the United States which, in its natural commercial advantages, in its climatic environment, and in the diversity of its soils, is so preëminently fitted for the development of an extensive and diversified horticulture as the peninsula to which Delaware belongs.

New Castle, the northern county, is hilly and rolling, and varies from a dense clay to a clay loam. Horticulturally, it is well adapted to plum, pear, apple and bush-fruit culture, and, in restricted areas, to the cherry, peach and trucking industries. But the production of hay, grain, and dairy products is the leading feature in New Castle's rural activities. Kent, the central county, is gently undulating. The soil varies from a clay loam in the northern part to a sandy loam along the southern border. The most diversified horticulture of the state, including tree fruits, bush fruits, strawberries, grapes, and vegetable products, has been developed here. In Sussex, the southern county, which is mostly level, a sandy soil predominates, although the underlying clay frequently approaches the surface and forms local areas of clay loam. The peach, strawberry, and bush fruits are most prominently developed in Sussex, the horticultural areas lying in the western half of the county.



684. Delaware, to illustrate the horticulture.

Delaware horticulture was born in 1832, with the peach industry, when the first extensive orchard was set near Delaware City. In a single year the value of its peach crop was $16,000. Then an era of the most rapid horticultural extension was inaugurated. By 1840, half a million baskets of peaches were shipped from the county. But in 1842 the peach-yellows broke out near Delaware City, and by 1867 more than one-half of the crop of three million baskets was grown in southern New Castle county. The orchards of New Castle had largely disappeared in 1870, and in 1890 it contained less than 5,000 acres. Kent county, however, in 1890 had 23,000 acres, and Sussex county 20,000 acres. In 1899, extensive orchards were being planted again in Newcastle county and northern Kent county.

The center of the peach belt in 1890 was along the southern border of Kent county, where the trees were comparatively healthy, but in 1890 the yellows had extended into northern Sussex, where it has remained stationary for several years. In 1896 the Delaware division of the Philadelphia, Wilmington & Baltimore railroad carried over two million baskets of Delaware peaches, which was over 90 per cent of the total crop, and estimated that there were between four and five million bearing trees in the state.

The peach-yellows has been responsible, primarily, for the shifting of the peach-growing centers. No systematic, coöperative effort has been made to suppress the disease. Yellows legislation is inoperative from a lack of public and political support. Intelligent growers remove trees at the first indication of infection, but the efforts of a few individuals have not been effective in checking the progress of the disease. The ultimate remedy for the yellows in Delaware lies in a more diversified horticulture.

The principal varieties of peaches are: Hale Early, Foster, Crawford Early, Oldmixon, Moore Favorite, Mountain Rose, Reeves Favorite, Elberta, Brandywine, Crawford Late, Stump, and Smock.

Next to the peach in commercial importance are the small fruit interests, which are most extensively developed in the southern half of Kent and the western half of Sussex. There are between 7,000 and 8,000 acres of strawberries, raspberries, and blackberries in these counties, and in 1896 the Delaware Division of the P. W. & B. R. R. carried 9,500,000 quarts, or over 90 per cent of the total product of the state. In 1898, this road carried over 24,000,000 quarts of berries, and a still larger quantity in 1899.

Since 1896, the Lucretia dewberry has been set out in large quantities in both Kent and Sussex counties, while the blackberry acreage has fallen off in consequence.

Among the principal varieties of strawberries are Bubach, Tennessee Prolific, Gandy, Greenville, Michel and Haverland. The Souhegan, Palmer and Mills comprise the prominent black raspberries; the Miller, Cuthbert, Loudon and Brandywine the red varieties; and Early Harvest and Wilson the blackberries.

In Kent county the pear industry is a prominent horticultural feature. The Kieffer is the leading variety. Its adaptability to various soils, its early and precocious bearing tendencies, and the cheapness of its production give it unusual commercial value throughout the state. In the fall of 1897 more than 40,000 Kieffer trees were sold in central and southern Kent county, and young orchards are not infrequently seen in Sussex and New Castle counties. Sussex county will develop the Kieffer to a large extent in the near future. In 1899, there were about 100,000 Kieffer trees under 3 years old and 60,000 trees over 3 years old in the state.

Previous to the advent of the Kieffer, the Bartlett, Duchess, Lawrence and Anjou were the leading kinds, the orchards existing in the two upper counties.

The introduction of the Japanese plum has opened the way to plum culture. Scattering orchards of Burbank and Abundance have been set in Sussex and New Castle counties, but an extensive development is under way in Kent. In the vicinity of Clayton and Smyrna there were 6,000 trees in bearing in 1897, since when 10,000 trees have been set. There were 32,000 trees in the state in 1899. The Japanese plums, as a class, are well adapted to the state. They are destined to prove an increasingly important factor in the horticulture in the future, but with their concentration in neighborhoods, their weak points may be expected to show more prominently. Burbank, Abundance and Ogon have been the leading varieties, and Red June, Chabot and Hale are growing in popularity.

The native plums of the Hortulana and Chickasaw groups, which ripen before the northern Domestica varieties, are rapidly attaining deserved prominence. They are hardy, easily grown, and generally command remunerative prices. Milton, Whitaker, Newman, Smiley and Wild Goose comprise the bearing orchards, but other varieties are growing in favor. The later ripening natives are worthless for Delaware, as the markets are then supplied with Domestica plums.

In the vicinity of Smyrna and Clayton there are from 150 to 200 acres of grapes, where the history of viticulture began about 1855. Grape culture has been a profitable industry in this neighborhood, the net income frequently exceeding $100 per acre. Recently, however, the profits have been somewhat less on account of the lower prices and the grape diseases. Many of the vineyards are models of intelligent tilling, pruning, spraying and training. The principal varieties are Niagara, Moore's Early, Concord, Brighton, Agawam and Wyoming Red.

Delaware is widely known, not only through her extensive orchards and small fruit plantations, but also through the products of her canning factories. In 1895 the tomato output amounted to 280,000 cases; peaches to 50,000 cases; peas to nearly a like quantity; corn to over 50,000 cases; and a large amount of berries, pears and other fruits, not separately classified. Since 1895, the amount of the various canned goods has not fluctuated widely, except with canned peas, which in 1898 had reached 144,000 cases; and with tomatoes, which have steadily increased.

Although Delaware is preëminently a horticultural state, its capabilities in horticulture are largely undeveloped. Its physical environment makes it a natural fruit garden. There are several industries that could be profitably introduced or extended to larger acreages. Apple culture; plum culture, of the Japanese and early native types; sour cherry culture, especially for canning; nut culture, on cheap land; vegetable growing, and glass-house gardening—all offer opportunities for a greater horticultural diversity. The various fruit interests are gradually extending over wider areas, and it may be expected that Delaware will not only maintain its present horticultural prestige, but will be an increasingly potent factor in American horticulture in the future.

G. Harold Powell.

DELPHÍNIUM (Greek, *a dolphin*, from the resemblance of the flower). *Ranunculàceæ.* Larkspur. A genus of beautiful hardy plants, with large, irregular flowers. About 60 species, native of the north temperate zone. Annual or perennial, erect, branching herbs: lvs. palmately lobed or divided: fls. in a showy raceme or panicle; sepals 5, petal-like, the posterior one prolonged into a spur; petals 2 or 4, small, the two posterior ones spurred, the lateral ones small, if present; the few carpels always sessile, forming many-seeded follicles. Full double forms are very common in a number of the species (compare Figs. 685, 686).

685. Single Larkspur.—D. grandiflorum.

686. Double Larkspur.—D. grandiflorum.

Delphiniums thrive in any good garden soil, but are improved by a deep, rich, sandy loam, exposed to the sun. Deep preparation of the soil is very important. The annuals are propagated from seed, which are very slow in germinating, and often should be sown in the fall to produce flowers early the next season. The perennials may be prop.: (1) By root division in the fall or spring. (2) By cuttings, about which J. B. Keller says: "Take a few cuttings from each plant in early spring, when growth is about 3 or 4 inches long, or else use the second growth, which has come after the flower-stems have been removed. Cuttings root readily in a shaded frame, no bottom heat being required, but an occasional sprinkling during dry and hot weather is necessary. When rooted they are treated like seedlings." (3) By seeds, started in the greenhouse or hotbed in March or even earlier. The young seedlings should be given plenty of room by transplanting as they grow, and may be set in the open garden by June. If started thus early they flower the first autumn, but the seed may be planted in late spring or summer, care being taken to water well during dry weather, and flowers will come the next summer. To get the best results, the perennials should be transplanted every 2 or 3 years. Two good crops of blossoms may be secured in one season by cutting away the flower-stems of the first crop as soon as the flowers have faded; of course no seeds will be produced in this way. The Delphiniums are much grown in the open garden and border, and are of great value for cut-flower purposes. Four species are of much greater popularity than the others: the annual, *D. Ajacis*, and the perennials, *D. grandiflorum*, *D. hybridum* and *D. formosum*. The last three have been especially prolific in named varieties.

Rocket and Candelabrum are names used to designate the forms of inflorescence in the two annual species. The "Rocket" or spike-like form is more commonly found in the Ajacis type, and the "Candelabrum," with a number of short spike-like heads of different heights, is found more often in Consolida.—A. Gray, An attempt to distinguish between the Amer. Delphiniums, Bot. Gaz. 12:49–54, 1887. E. Huth, Monographie der Gattung Delphinium, in Eng. Bot. Jahrb. 20:322–499, 1895.

Alphabetical list of species described below: Ajacis, 1; *alpinum*, 16; altissimum, 14; *azureum*, 18; bicolor, 7; *Breckii*, 17; Brunonianum, 8; cardinale, 4; Carolinianum, 18; Cashmerianum, 10; cheilanthum, 24; Chinense, 17; *Columbianum*, 22; Consolida, 2; decorum, 9; elatum, 16; exaltatum, 15; formosum, 25; grandiflorum, 17; hybridum, 27; Maackianum, 26; Menziesii, 12; mesoleucum, 19; nudicaule, 3; Nuttallii, 22; *occidentale*, 23; pauciflorum, 13; *Prsewalskianum*, 5; Przewalskii, 5; *pyramidale*, 16; scopulorum, 23; simplex, 21; *Sinense*, 17; *sulphureum*, 6; tricorne, 11; trolliifolium, 20; *virescens*, 18; Zalil, 6.

A. *Annuals: petals only 2, united: follicle 1.*

1. **Ajàcis**, Linn. Fig. 687. An erect annual, about 18 in. high, with a few spreading branches: lvs. of stem sessile, deeply cut into fine, linear segments; root-lvs. similar, but short-petioled: fls. showy, blue or violet, varying to white, more numerous than in *D. Consolida*, in a spicate raceme; petals 2, united; calyx-spur about equaling the rest of the flower: follicle only 1, pubescent; seeds with wrinkled, broken ridges. May–Aug. Eu. R.H. 1893, p. 228. Same figure in S.H. 2:282.

2. **Consólida**, Linn. An erect, hairy annual, 1–1½ ft. high: lvs. similar to *D. Ajacis:* fls. few, loosely panicled, pedicels shorter than the bracts, blue or violet or white; petals 2, united: follicle 1, glabrous; seeds with broken, transverse ridges. June–Aug. Eu. Baxter Brit. Bot. 4, t. 297. R.H. 1893, p. 228 (var. *ornàtum Candelàbrum*). Var. **imperialis**, Hort. (*D. imperialis fl. pl.*, Hort.). Fls. double. From the English gardens.

AA. *Perennials: petals 4: follicles 3–5.*

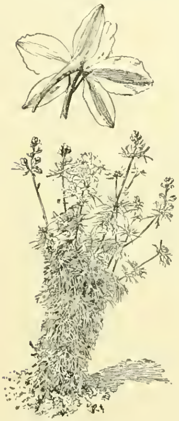
B. *Sepals red.*

3. **nudicaùle**, Torr. & Gray. Stem 1–1½ ft. high, glabrous, branched, few-lvd.: lvs. rather succulent, 1–3 in. across, lobed to the middle or farther 3–7 times, the secondary lobes rounded and often mucronate; petioles 3–5 in. long, dilated at the base: fls. panicled; sepals bright orange-red, obtuse, scarcely spreading, shorter than the stout spur; petals yellow, nearly as long as sepals: follicles 3, spreading and recurved, soon becoming glabrous; seeds thin-winged. April–July. Along mountain streams, northern Calif. B.M. 5819. F.S. 19:1949. R.H. 1893, p. 259. A good perennial in the E.

4. **cardinàle**, Hook. Stem erect, 2–3½ ft. high, partly pubescent: lvs. smooth, fleshy, deeply 5-parted, the parts cut into long, linear lobes: raceme elongated, many-fld.: fls. bright red, with petal limbs yellow: follicles glabrous, usually 3; seeds smooth. July, Aug. Calif. B.M. 4887. Gt. 208. F.S. 11:1105. R.B. 6:101. Gn. 19:273.

BB. *Sepals clear yellow or tipped with blue.*

5. **Przewálskii**, Huth. (*D. Prsewalskiànum*, Hort.). Nearly glabrous, often branched at base, erect, varying much in height: lvs. 3–5 times deeply parted, parts divided into narrow, obtuse lobes: fls. clear yellow, or sometimes tipped with blue; spur equaling the sepals: follicles 3, densely hairy. July, Aug. Asia. Int. 1892.



687. Delphinium Ajacis—The common annual Larkspur.

6. **Zàlil**, Aitch. & Hems. (*D. sulphùreum*, Hort. *D. hỳbridum*, var. *sulphùreum*, Hort.). Stem nearly simple, erect, 1–2 ft. high, rather glabrous, or becoming so: lvs. of several narrow, linear lobes, dark green, petioles not dilating at the base: fls. large, light yellow, in long racemes: follicles 3, longitudinally furrowed and ribbed; seeds with transverse, fibrous plates. June, July. Persia. Int. 1892. B.M. 7049. Gn. 50:1094; 54, p. 347. G.C. III. 20:247. Seedlings from tubers and plants die down as if dead; but they make a second growth after a short period of rest.

BBB. *Sepals blue or varying to white.*

C. *Height 1½ ft. or less.*

D. *Petioles dilating at the base.*

7. **bícolor**, Nutt. Erect, rather stout, ½–1 ft. high, from fascicled roots: lvs. small, thick, deeply parted and divisions cleft, except perhaps in the upper lvs.; segments linear and obtuse: raceme rather few fld., the lower pedicels ascending 1–2 in.: spur and sepals nearly equal, ½ in. long or more, blue; upper petals pale yellow or white, blue-veined; lower petals blue: follicles glabrous or becoming so. May–Aug. Dry woods, Colo., west and north to Alaska.

8. **Brunoniànum**, Royle. MUSK LARKSPUR. Stems erect, ½–1½ ft. high: plant somewhat pubescent: upper lvs. 3-parted, lower ones reniform, 5-parted; segments deeply cut, musk-scented: fls. large, light blue with purple margins, center black; spur very short; sepals 1 in. long, membranous and often clinging until the fr. is mature: follicles 3 or 4, villose. June, July. China. B.M. 5461. R.B. 1863:34.

9. **décorum**, Fischer & Meyer. Stem slender and weak, ½–1½ ft. high, smooth or nearly so: lvs. few, bright green; upper ones small, 3–5-parted into narrow lobes; lower and radical ones somewhat reniform in outline and deeply 3–5-parted, lobes often differing widely: fls. in a loose raceme, or somewhat panicled; sepals blue, ½ in. long, equaling the spurs; upper petals at least tinged with yellow: follicles 3, thickish, glabrous. Spring. Calif. Int. 1881. B.R. 26:64.

DD. *Petioles hardly dilating at the base.*

E. *Upper petals never yellow.*

10. **Cashmeriànum**, Royle. Plant pubescent, not very leafy: stem, simple, erect, slender, 10–18 in. high: root-lvs. orbicular, 2–3 in. in diameter, 5–7-lobed, coarsely, acutely toothed and cut; petiole 5–8 in. long; stem-lvs. short-petioled, 3–5-lobed, cut like the radical ones, all rather thick, and bright green: inflorescence corymbose, the branches rather spreading: fls. 2 in. long, deep azure blue; spur broad, obtuse, inflated, decurved, little over half as long as sepals; upper petals almost black, 2-lobed, lateral ones greenish: follicles 3–5, hairy. July–Sept. Himalayas. B.M. 6189. Gt. 1105. Gn. 18:261. R.H. 1893, p. 259. Hardy in Mass., and choice.

Var. **Wálkeri**, Hook. Stem very short, leafy, many-fld.: upper lvs. less lobed or almost entire, small, long-petioled: fls. very large, light blue with yellow petals. Suited to rockwork. B.M. 6830.

EE. *Upper petals yellow or striped with yellow.*

11. **tricórne**, Michx. Stem succulent, about 1 ft. high: lvs. 3–5-parted, with 3–5-cleft linear lobes; petioles

smooth, hardly dilating at the base: fls. large, blue, rarely whitish; upper petals sometimes yellow, with blue veins, lower ones white-bearded; sepals nearly equaling the spur: follicles 3–4, very long, becoming glabrous, strongly diverging; seeds smooth. May. Northern states. L.B.C. 4:306.—Very beautiful and much used. Best for rockwork. The foliage dies down in midsummer and the plant appears as if dead.

12. **Ménziesii**, DC. Plant sparingly pubescent: stem simple, slender, ½–1½ ft. high, few-lvd.: lvs. small, 3–5-parted, the divisions mainly cleft into linear or lanceolate lobes; petioles hardly dilating at the base: fls. in simple, conical racemes; sepals blue, somewhat pubescent outside, nearly equaling the spurs in length; upper petals yellowish: follicles 3, pubescent, or sometimes glabrous; seeds black, winged on the outer angles. April–June. On hills, Calif. and northward to Alaska. B.R. 14: 1192.

13. **pauciflòrum**, Nutt. Roots oblong or fusiform, fasciculate-tuberous: stems slender, nearly glabrous, ½–1 ft. high: lvs. small, parted into narrow, linear lobes; petioles not dilating at base: fls. and fr. similar to those of *D. Menziesii*, but on shorter pedicels. May, June. Colo. to Wash. and Calif. Int. 1892.

CC. *Height usually more than 1½ ft.*

D. *Seeds wrinkled or smooth, not winged nor scaly.*

E. *Follicles always 3.*

14. **altíssimum**, Wallich. Plant shaggy-hairy above: stem tall and slender, branched: lvs. palmately 5-parted, the divisions 3-lobed and toothed: bracts long-lanceolate: fls. blue or purple, in long, branching racemes; spur straight or slightly incurved, equaling the sepals; petals 2-lobed: follicles 3, erect; seeds not winged or scaly. Aug., Sept. Himalayas.

15. **exaltàtum**, Aiton. Stem stout, 2–4 ft. high, smoothish: lvs. flat, nearly glabrous, deeply cleft into 3–7 wedge-shaped lobes, which are often trifid; petioles usually not dilated at the base: fls. blue, with yellow on the upper petals, medium in size, on long, crowded, erect, pyramidal racemes; sepals nearly equaling the spur in length: follicles 3, pubescent or smooth; seed coats irregularly wrinkled. June–Aug. Borders of woods, Ala. to Minn.

16. **elàtum**, Linn. (*D. alpìnum*, Waldst. & Kit. *D. pyramídale*, Royle). BEE LARKSPUR. Glabrous, 2–6 ft. high: lvs. somewhat pubescent, 5–7-parted, parts rather narrow, cut-lobed; upper lvs. 3–5-parted; petioles not dilated at the base: raceme much like *D. exaltatum* or more spike-like: fls. blue, with dark violet petals; sepals ovate, glabrous, nearly equaling the spurs: follicles 3; seeds transversely wrinkled, not scaly. June–Aug. B.R. 23:1963. Gt. 736 b. &c. (vars.) F.S. 12:1287. (var. fl. pl.). R.H. 1859, p. 529; 1893, p. 258—A polymorphous and complex species of Europe. It is probable that all or nearly all the plants sold here under this name should be called *D. exaltatum*, which is a closely allied species.

17. **grandiflòrum**, Linn. (*D. Sinénse*, Fischer). Figs. 685–6. Stem rather slender, 2–3 ft. high: lvs. rather small, many times parted into nearly distinct, narrow, linear lobes: fls. large, blue, varying to white, the spur and lower petals often violet, upper petals often yellow; spurs long and taper pointed: follicles 3, pubescent; seeds triangular, coats wrinkled, not scaly. July, Aug. Siberia. Int. 1880. B.M. 1686. Gn. 46:991 and p. 484. Var. **álbum**, Hort. Fls. pure white. Var. **albo-plèno**, Hort. Fls. double and pure white. Var. **flore-plèno**, Hort. (var. *hýbridum fl.-pl.*, Hort.). Fls. double, blue, very pretty. R.H. 1893, p. 259; 1895, p. 379 (same).

Var. **Chinénse**, Fischer. Stem very slender, not much branched: lvs. and fls. like the type, but fls. more numerous. China. L.B.C. 1:71.—A favorite garden form. The double blue form has been known as *D. Bréckii*, Hort.

EE. *Follicles varying from 3 to 5.*

18. **Caroliniànum**, Walt. (*D. azùreum*, Michx. *D. viréscens*, Nutt.). Plant somewhat pubescent: stem 1½–2½ ft. high, not much branched: lvs. 3–5-parted, the divisions 3–5-cleft into usually linear lobes: racemes spicate, usually many-fld.: fls. azure blue, but varying to whitish or white; sepals often with a brownish spot: follicles 3–5, oblong, erect; seeds transversely wrinkled. July. N. C. to Ill., west and south. P.M. 16:258. Var. **álbum**, Hort. (var. *álbidum*, Hort.). Stems 2–3 ft. high: lvs. larger than the type and with broader divisions: fls. creamy white.—The double form of this is not much used.

Var. **vimíneum**, Gray. Stem 2–4 ft. high, sometimes branched, broader-lvd., looser-fld.: fls. violet or white. Tex. B.M. 3593. B.R. 23:1999 (as *D. azureum*).

19. **mesoleùcum**, Link. Stem 3 ft. high, pubescent above: lvs. 3–5-parted, the segments wedge-shaped and deeply serrated; petioles somewhat dilated at the base: fls. blue, with pale yellow or whitish petals: seeds not seen. June. Nativity not known.

DD. *Seed winged.*

E. *Upper petals never yellow.*

20. **trolliifòlium**, Gray. Stem 2–5 ft., leafy, often reclining: lvs. thinnish, large, often reniform at base, 3–7-parted; lobes wedge-shaped, incised: racemes in larger plants 1–2 ft. long and very loose: fls. blue, with upper petals white; spur and sepals each ¾ in. long: follicles glabrous; seeds with thin wing or crown at the end. Apr. Moist grounds, Columbia river. Int. 1881.

EE. *Upper petals often yellow.*

21. **símplex**, Dougl. Stem nearly simple, 2–3 ft. high, soft-pubescent throughout: lvs. many-parted, into linear divisions and lobes: racemes dense, little branched: fls. pale blue, with upper petals yellow, lower petals white-bearded; sepals equaling the spur: follicles 3, pubescent; seeds dark, with margins white-winged. June. Mountains of Idaho and Oregon. Int. 1881.

22. **Núttallii**, Gray (*D. Columbiànum*, Greene). Stem erect, simple, nearly glabrous, leafy, 1½–2½ ft.: lvs. thinnish, 3–5-parted, parts divided into many linear-oblong lobes: racemes long, many-fld.: sepals deep blue, ovate, sparingly pubescent, shorter than the spur; petals blue or upper ones yellow, lower ones white-bearded: follicles 3, pubescent, rather erect; seeds thin, dark, with yellow wings. Summer. Low, open woods, Columbia river. Int. 1892.

23. **scopulòrum**, Gray. Stem 2–5 ft., glabrous, at least below: lvs. 5–7-parted, the upper ones the more narrowly cleft; petioles dilating at the base: racemes simple, densely many-fld.: fls. blue or purple, rarely white, upper petals often yellow; spur ½ in. long, equaling the sepals: follicles 3, pubescent; seeds large-winged. Aug., Sept. Moist ground, west of Rockies.—A polymorphous species.

Var. **subalpìnum**, Gray (*D. occidentàle*, Wats.). A smaller plant, pubescent above: broader divisions of lvs., shorter racemes, larger and deeper-colored fls.: follicles glabrous. Wasatch mountains.

688. Delphinium formosum.

24. **cheilánthum**, Fischer. Stem erect, simple or branched, 2–3 ft.: lvs. glabrous or slightly pubescent, 5-parted, the lobes pointed, sub-trifid, and somewhat toothed: fls. dark blue, the upper petals sometimes pale yellow, the lower ones inflexed, ovate, entire; spur rather long, straight or somewhat curved: follicles 3, either glabrous or pubescent; seeds 3-cornered, 3-winged, not scaly. June, July. Siberia. B.R. 6:473. Gt. 13:253. P.M. 16:258 (as *D. magnificum*).

DDD. *Seeds scaly.*

25. **formòsum**, Boiss. & Hult. Fig. 688. Stem strong, 2–3 ft., hairy below, rather glabrous above: lower lvs. 5–7-parted, long-petioled; upper ones 3–5-parted, short-petioled or sessile, all alternate: racemes many-fld.: fls. blue, with indigo margins; spur long, violet, bifid at the tip: follicles 3, pubescent; seeds scaly. June, July. Asia Minor perhaps, but its origin is disputed. F.S. 12:1185. Vick's Mag. 2305. R.H. 1859, p. 528.—The most permanent form for naturalizing.

26. **Maackiànum**, Regel. Erect, 3 ft. high, pubescent or glabrous, branched above: lvs. pubescent on both sides, base often truncate or reniform, 3–5-parted, the parts serrate; petioles dilated at the base: peduncles yellow-hairy, with the bracts often inserted above the base: fls. in loose panicles, sepals blue, ½ as long as the spurs; petals dark violet: follicles often glabrous, ¾ in. long; seeds small, distinctly scaly. July. Siberia. Gt. 344.

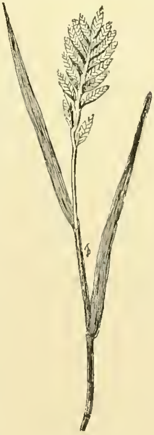
27. **hŷbridum**, Steph. Stem 3–4 ft., pubescent above: root somewhat bulbous: lvs. 5–many-parted; lobes linear; petioles dilated and sheathing at the base: racemes dense: fls. blue, lower limbs white-bearded; spur straight, longer than the sepals: follicles 3, hairy; seeds ovate, with transverse scales. June–Aug. Mountains of Asia. R.H. 1893, p. 258; same cut in S. H. 2:282.—There are many double and semi-double vars. of this type.

Var. **Bárlowi**, Paxt. Very large, semi-double fls., deep blue, with brownish center. A supposed hybrid with *D. grandiflorum*. B.R. 23:1944. Int. 1892.

D. cœrulèscens, Freyn. A fine Asiatic species, with single and double forms. P.M. 16:258.—*D. Wheèlerii* is listed in the trade, but is of unknown origin.

K. C. Davis.

DEMAZÈRIA (*Desmazeria*). *Gramineæ*. Annuals or perennials, with narrow, involute leaf-blades: spikelets peculiarly distichous on two sides of a 3-sided rachis, many-fld., sessile, or some of the lower spikelets pedicellate. Four species known. Mediterranean and S. African.



639. Demazeria Sicula. (× ½.)

sícula, Dum. (*Brizopŷrum Sículum*, Link.). Spike Grass. Fig. 689. A smooth, erect annual, 8 in. to 1 ft high: lvs. few: panicle spike-like, 2–3 in. long; spikelets ovate to linear, 8–20-fld. Mediterranean.—Frequently used for edging.

P. B. Kennedy.

DEMERARA ALMOND. Consult *Terminalia*.

DENDRÒBIUM (*tree* and *life:* they are epiphytes). *Orchidàceæ*, tribe *Epidéndreæ*. A genus containing many species of great horticultural merit. Flowers racemose, fasciculate or solitary; perianth usually spreading; labellum articulate or connate with the base of the column; column short, semiterete; base produced conspicuously; pollinia 4: stems cane-like, in some species deciduous, so that during the resting season the plants appear like a group of dried sticks. The species (more than 300) are distributed through the tropical countries of the eastern hemisphere, Australia, Japan, China, India and the Philippine Islands furnishing a large number. They are particularly abundant in parts of India. No species are known in Africa. The term pseudobulbs has been used throughout this article for the sake of uniformity, but these members are very variable in the genus, ranging from very large (several feet long) to very small and thin. The flowers are of many sizes, forms and colors. Some of the species resemble Epidendrums, Cattleyas, and other genera.

Oakes Ames.

The growing of most of the commercial Dendrobiums can generally be understood and accomplished in observing three steps: (1) The season of rain, that produces the abundance of growth. (2) The season of colder temperature, to ripen the wood. (3) The dry season, producing the flowers.

In the selection of varieties, there are very few that will not respond to the treatment suggested by this scheme. *D. thrysiflorum, fimbriatum, chrysotoxum, Farmerii*, and all varieties of this group, respond most generously to this treatment in the warm glasshouse. There are no plants more beautiful in the orchid family.

The soil required is equal parts of clean peat and moss. Fix the plants very firmly in pots or baskets. While growing, an abundance of water must be given, with syringing on all fine days. When the growth is well made and developed, then comes the season of rest, and water can be withheld gradually, until finally none is given. Commercially speaking, Dendrobiums can be flowered in any ordinary glasshouse, and with only partial shade. Another method is to give more shade at the growing season, and more air at the resting period.

The propagation of these species is by division of the growths, either in the resting season or the starting of the growing season. Pruning is not to be practiced, as, being of slow growth, they require the leaves for the furnishing of the plant. Shading should be adopted. With all Dendrobiums, care should be taken not to overpot. Grow in small pots or baskets, so as to confine the roots. *D. Dearei* may be grown continuously, without rest.

The commoner conservatory Dendrobiums, as *D. Phalænopsis, D. Ainsworthii*, etc., are propagated by laying the stems flat on baskets, attaching them firmly by means of wire. Pruning of these varieties was once practiced extensively, but when there is plenty of growth the stem and flowers can be cut at the same time; this adds more beauty to the flower. *D. nobile* and *D. Wardianum* are easy to grow, only care should be taken not to be too severe on all classes of this section, after the growth is made, until midwinter. They bloom best when the late autumn sun partially ripens the stems. See *Orchids*.

Colin Ogston.

Index: aggregatum, 14; Ainsworthii, 43; albiflorum, 10; albo-sanguineum, 48; amœnum, 58; anosmum, 68; Aphrodite, 63; aqueum, 53; aureo-flavum, 10; *aureum*, 50; Balleanum, 43; Barberianum, 60; *barbatulum*, 19; Bensoniæ, 67; bicameratum, 12; bigibbum, 22; Boxallii, 61; Brymerianum, 16; Calceolaria, 30; *Calceolus*, 30; capillipes, 41; cariniferum, 32; chrysanthum, 54; *Chrysotis*, 27; chrysotoxum, 17; clavatum, 24; Cooksonianum, 43; crassinode, 60; crepidatum, 66; cretaceum, 74; cruentum, 33; crumenatum, 6; cumulatum, 2; crystallinum, 65; Dalhousianum, 31; Dayanum, 18; Dearei, 3; densiflorum, 8; Devonianum, 57; dixanthum, 29; Draconis, 37; erythroxanthum, 13; Falconeri, 62; Farmerii, 10; Findleyanum, 46; fimbriatum, 25; formosum, 35; Freemanii, 69; fuscatum, 26; Fytchianum, 19; Gibsonii, 28; giganteum, 62, 68, 71; gratiosissimum, 64; Griffithianum, 9; heterocarpum, 49; hololeuca, 23; Hookerianum, 27; infundibulum, 36; Jamesianum, 36; Japonicum, 40; Jenkinsii, 15; lasioglossum, 52; leucolophotum, 4; Linawianum, 44; lituiflorum, 69; Loddigesii, 56; longicornu, 34; Lowii, 39; luteolum, 50; Macfarlanei, 20; macrophyllum, 18, 68; McCarthiæ, 70; *moniliforme*, 40; moschatum, 30; *nobile*, 43; nobilius, 43; ochreatum, 55; oculatum, 25; Palpebræ, 5; Parishii, 45; *Paxtoni*, 25, 54; Phalænopsis, 23; Pierardi, 73; primulinum, 72; *pulchellum*, 56; rhodopterygium, 49; Ruckeri, 51; scabrilingue, 38; Schrœderianum, 23; Schrœderi, 8; secundum, 1; suavissimum, 17; sulcatum, 11; superbiens, 21; superbum, 68; thyrsiflorum, 7; tortile, 47; transparens, 71; *Veitchianum*, 18; Wardianum, 59.

A. *Inflorescence racemose (fl. usually solitary in Jenkinsii).*

B. *Racemes densely flowered.*

C. *Petals pinkish or purplish.*

1. **secùndum**, Wall. Pseudobulbs terete, nearly 2 ft. long: lvs. ovate-oblong: fls. all on one side of peduncle, crowded; petals smaller than sepals, rose-mauve; labellum paler, with an apical blotch of orange. Sumatra.

2. **cumulàtum**, Lindl. Pseudobulbs tufted, slender, erect, about 18 in. long: lvs. oblong: fls. 1 in. across, purplish, suffused with white; inflorescence globose. Burma.

CC. *Petals white.*

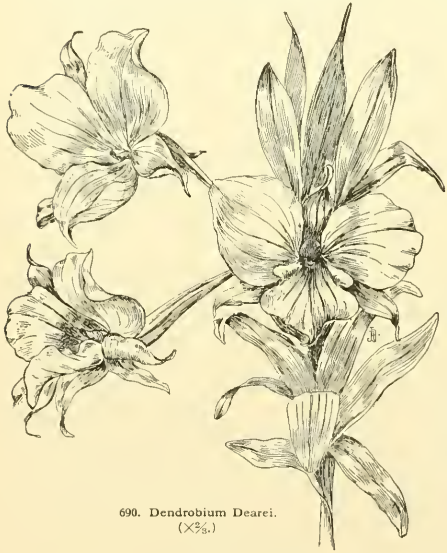
3. **Dèarei**, Reichb. f. Fig. 690. Pseudobulbs tall: lvs. about 2 in. long, oval-oblong: fls. about 2 in. across, white; sepals lanceolate; petals nearly orbicular; labellum oblong, with a pale, yellowish green blotch in the throat. Philippine Isls. Gn. 54, p. 237. G.C. III. 24:193.

4. **leucolophòtum**, Reichb. f. Pseudobulbs stout, erect: racemes many-fld.: fls. white, lateral lobes of labellum greenish; midlobe narrowly oblong. Malay archipelago.

5. **Pálpebræ**, Lindl. Pseudobulbs clavate, 4-angled: lvs. oblong-lanceolate: raceme loosely fld.: fls. white, with a yellowish disk near the base of the labellum. Burma.

6. **crumenàtum**, Swartz. Pseudobulbs erect: lvs. ovate-oblong: raceme terminal, many-fld.: sepals and petals ovate; labellum white. Malay archipelago.

7. **thyrsiflòrum**, Reichb. f. Pseudobulbs terete, jointed: lvs. oblong: racemes pendulous, ample: sepals and petals white; labellum yellow, downy-pubescent. Burma. B.M. 5780. I.H. 22:207. Gn. 50, p. 28. A.F. 3:155. F.E. 9:329. J.H. III. 31:229. G.C. II. 15:463.—Much like the next, and by some united with it.



690. Dendrobium Dearei. (×⅔.)

CCC. *Petals yellow.*

8. **densiflòrum**, Wall. Pseudobulbs jointed, about 15 in. high: lvs. oblong: racemes pendulous, ample: fls. 1½–2 in. across; sepals and petals yellow; labellum orange-yellow, downy-pubescent. Nepal. B.M. 3418. G.C. II. 17:737; III. 14:123 and 24:185.

Var. **Schrœderi**, Hort. (var. *álbum*, Hort.), has whitish sepals and petals. A.G. 20:5.

9. **Griffithiànum**, Lindl. Pseudobulbs clavate: lvs. lanceolate-oblong: fls. in drooping, flexuose racemes; petals ciliate, yellow. Burma.

10. **Fármerii**, Paxt. Pseudobulbs round, attenuate at base, thickening above: lvs. oblong: racemes ample, pendulous: fls. 2 in. across, tinged with pink; throat of labellum orange-yellow; sepals oblong; petals oval. Khasia Hills. B.M. 4659.—Var. **albiflòrum**, Hort. (var. *álbum* of catalogues), has white fls., the labellum marked with yellow. F.S. 23:2461. Var. **aùreo-flàvum**, Hort. (*aùrea* of catalogues?). Fls. golden yellow; disk of labellum deeper yellow.

11. **sulcàtum**, Lindl. Pseudobulbs clavate, compressed: lvs. ovate-oblong: racemes 10 or more fld.: fls. yellow, crowded. Khasia Hills. B.M. 6962.

12. **bicameràtum**, Lindl. (*D. breviflòrum* of catalogues). Pseudobulbs fusiform or clavate, about 18 in. long: lvs. elliptic, oblong: fls. yellow, marked with red, clustered on a short rachis, forming a capitate raceme. Sikkim.

13. **erythroxánthum**, Reichb. f. Fls. in dense racemes, yellowish striped with crimson-purple. Philippine Isls.

BB. *Racemes loosely flowered.*

C. *Pseudobulbs one-leaved.*

14. **aggregàtum**, Roxb. Lvs. oblong, coriaceous, at the summits of ovate pseudobulbs: fls. yellow, numerous, in lateral drooping racemes; sepals ovate; petals broadly ovate; labellum broader than long, with orange throat; disk pubescent. Burma. B.M. 3643.—Var. **màjus**, Hort., is a larger-fld. form.

15. **Jénkinsii**, Wall. Pseudobulbs short, compressed: lvs. oblong, coriaceous: fls. orange-yellow, solitary; sepals oval; petals broadly ovate. Assam. B.R. 25:37.—Very like *D. aggregatum.*

CC. *Pseudobulbs leafy at summit.*

D. *Flowers yellow.*

E. *Labellum pectinately fringed.*

16. **Brymeriànum**, Reichb. f. Pseudobulbs jointed, slender, about 2½ ft. high, sometimes much shorter: lvs. several, lanceolate: fls. fleshy, golden yellow; upper sepal oblong; petals and lateral sepals very similar; labellum reflexed at apex, disk downy; margin provided with a conspicuously long and pectinate fringe. Burma. B.M. 6383. A.F. 6:609. G.C. II. 11:475; 16:689.

EE. *Labellum not pectinately fringed.*

17. **chrysotóxum**, Lindl. Pseudobulbs clavate: lvs. several, 4 in. long, coriaceous: racemes arching, many-fld.: petals and sepals about equal, golden yellow; labellum of similar color, deeper in the throat. Burma. B.M. 5053. G.F. 5:533. Gn. 48, p. 239.—Var. **suavíssimum**, Hort. Pseudobulbs stout: fls. delightfully fragrant; labellum with blotch deeper-colored than in the type. Burma, 1847.

DD. *Flowers greenish.*

18. **macrophýllum**, Rich. (*D. Veitchiànum*, Lindl.). Pseudobulbs clavate, compressed: lvs. oblong: racemes many-fld.: fls. large; sepals greenish, hairy behind; petals whitish; lateral lobes of labellum greenish, shaded with purple; midlobe greenish, with purple-dotted lines. I.H. 35:57.—Sold as *D. Veitchianum*, not *D. macrophyllum* of gardens (see *D. superbum*). Java. **Dayànum**, Hort., is said to be a better form than the type.

CCC. *Pseudobulbs more or less leafy to base.*

D. *Flowers white.*

19. **Fytchiànum**, Batem. (*D. barbátulum*, Hort.). Pseudobulbs slender: lvs. oblong-lanceolate, acute: racemes 10–15-fld.: fls. white; lateral lobes of the labellum tinted with purple. Burma. B.M. 5444.

20. **Macfárlanei**, Reichb. f. Fls. several inches across, white; labellum marked with purple, 3-lobed; sepals lanceolate; petals narrowly ovate-lanceolate, acuminate. New Guinea.

DD. *Flowers purple.*

21. **supérbiens,** Reichb. f. Pseudobulbs cylindric: lvs. linear-oblong: racemes remotely fld.: fls. rich magenta-purple; sepals and petals undulate-margined; labellum similar in color, 3-lobed, lateral lobes incurved; disk with raised white lamellæ. North Queensland.

22. **bigibbum,** Lindl. Pseudobulbs elongated, erect, 1 ft. or more high: lvs. oblong-lanceolate: racemes suberect: fls. magenta-purple; sepals oblong-lanceolate; petals spreading, reflexed; labellum 3-lobed, lateral lobes incurved, deeper colored than the petals, with a white crest. Torres Straits. B.M. 4898. I.H. 30:476.

23. **Phalænópsis,** Fitzg. Pseudobulbs tall, terete: lvs. lanceolate: fls. on slender pedicels, pale mauve; sepals lanceolate, spreading, paler than the petals; petals orbicular, spreading; labellum 3-lobed, lateral lobes incurved. Australia. B.M. 6817. A.G. 20:5. G.F. 5:440. A.F. 13:1224. For var. **Schrœderiànum,** see G.C. III. 10:642–3; 15:339. R.B. 23:85. A.F. 10:401. For var. **hololeùca,** see G.C. III. 18:397. J.H. III. 31:149.—One of the most useful Dendrobiums for cut-flower purposes. There are many fine varieties, pale in color or even white.

DDD. *Flowers yellow.*

E. *Labellum not slipper-like.*

24. **clavàtum,** Lindl. Pseudobulbs cylindric, 20 or more in. long: lvs. ovate-lanceolate: racemes few-fld.: fls. orange-yellow; labellum brighter yellow, with a maroon blotch, denticulate on the margin. Nepal. B.M. 6993.

25. **fimbriàtum,** Hook. Pseudobulbs 2 or more ft. high, slender: lvs. lanceolate, dark green: racemes lax, pendulous: sepals and petals orange-yellow, ciliate; labellum yellow, with an orange-yellow throat, margin irregularly fringed. Nepal. G.C. III. 25:305. Var. **oculàtum,** Hort. (*D. Páxtoni*, Paxt.), has smaller fls., with a deeper colored blotch on the labellum. B.M. 4160. G.C. III. 14:97.

26. **fuscàtum,** Lindl. Pseudobulbs cylindric or nearly so: lvs. ovate-lanceolate: racemes with a zigzag rachis, drooping: fls. yellow, with 2 maroon spots on the labellum. Sikkim, Himalayas.

27. **Hookeriànum,** Lindl. (*D. Chrysòtis*, Reichb. f.). Pseudobulbs slender, swollen at the base: lvs. lanceolate to oblong: fls. large, in pendulous racemes, golden yellow; labellum with 2 deep maroon blotches, margin fringed. Sikkim. B.M. 6013. J.H. III. 33:221.

28. **Gibsonii,** Paxt. Lvs. lanceolate: racemes from the upper nodes of the stems: fls. 5 or more, yellow, with maroon spots on the labellum. Khasia Hills.

29. **dixánthum,** Reichb. f. Pseudobulbs clavate, about 2 ft. long: lvs. linear-lanceolate: fls. yellow, in racemes from the upper part of the stems. Burma.

EE. *Labellum slipper-like.*

30. **moschàtum,** Wall. Pseudobulbs several ft. high, leafy from the base: lvs. oblong-linear, striate: fl.-stem radical, longer than the pseudobulbs: racemes pendulous: fls. 2–4 in. across; sepals and petals about equal, oblong, orange-yellow; labellum inflated, colored like the petals, with crimson markings at the base. Burma. B.M. 3837. Var. **Calceolària,** Hort. (*D. Calcèolus*, Hort.). Fls. smaller, orange-yellow.

31. **Dalhousiànum,** Wall. Pseudobulbs elongated, rod-like, spotted with purple when young: lvs. clasping, narrowly ovate: racemes pendulous, lax: fls. large; sepals spreading, yellow, tinted with rose; labellum concave, orbicular, blotched at base with maroon-purple. Burma. B.R. 32:10. I.H. 28:423. Gn. 48:1032, p. 223. G.C. III. 21:157.

AA. *Inflorescence not racemose.*

B. *Pseudobulbs black-hairy.*

C. *Leaves deciduous.*

32. **cariníferum,** Reichb. f. Pseudobulbs subcylindric, 6–9 in. long: lvs. narrowly oblong: fls. 1½ in. across, solitary or in 2's or 3's, near apex of stem; sepals lanceolate, acute, strongly keeled at back, pale fawn-yellow, fading to ivory white; petals ovate, white; labellum 3-lobed, spurred at base, side lobes triangular, reddish orange, midlobe spreading, undulate, tufted, with long woolly hairs along the veins on the upper surface, reddish orange at base, usually white at apex. Burma. B.M. 6715 (var. *Wattii*).

33. **cruéntum,** Reichb. f. Pseudobulbs erect, terete, 1 ft. long, swollen at base: lvs. elliptic-oblong, deciduous: fls. solitary or in pairs, 1½–2 in. across; sepals triangular-ovate, keeled at back, pale green, longitudinally veined with darker green; petals linear-acute, colored like the sepals; labellum 3-lobed, lateral lobes oblong, erect, crimson-scarlet, midlobe ovate, apiculate, pale green, with red border, and a large warty crest, below which are 5 raised red lines, the 2 outermost being most developed. Malay Isl. G.C. III. 18:91.

34. **longicórnu,** Lindl. Pseudobulbs slender, 8–12 in. high: lvs. linear-lanceolate, 2–2½ in. long: fls. solitary or in 2's or 3's, not fully expanding; sepals and petals sub-equal, elliptic-oblong, transparent white; labellum funnel-shaped, anterior portion fimbriate, white, with a broad raised orange-red central band, with divergent lateral streaks of same color; spur slender. Burma.

CC. *Lvs. not deciduous.*

35. **formòsum,** Roxb. Pseudobulbs stout, erect: lvs. ovate-oblong: peduncle from the summit of the stem, 3–5-fld.: fls. 3–4 in. across, white; sepals oblong-lanceolate, apiculate; petals nearly orbicular; labellum large, the small basal lobes clasping the column, throat with a yellow band, which expands in a large yellow blotch near the distal end. Khasia Hills. B.R. 25:64. Var. **gigantèum,** Hort. Fls. measure 4–5 in. across. G.C. III. 24:471. Gng. 1:118–9. F.E. 10:1240.

36. **infundíbulum,** Lindl. Fls. white; sepals spreading, elliptic-oblong; petals broad; labellum large, with an orange-yellow blotch in the throat; basal lobes infolding the column. Burma. B.M. 5446. I.H. 21:172. Var. **Jamesiànum,** Hort. Pseudobulbs stouter and more rigid: labellum of flower differently formed, especially the side lobes, which are roughened on their inner surface; disk cinnamon red.

37. **Dracònis,** Reichb. f. Pseudobulbs stout, erect, 12–18 in. long: lvs. lanceolate, 3–4 in. long: fls. in fascicles from the uppermost joints of the stem, 1½ in. in diam., ivory white, striped with orange-red at base of labellum; sepals lanceolate, acute; petals oblong-lanceolate, reflexed at tips; labellum 3-lobed, lateral lobes small, rotund; midlobe oval, oblong, crisped and minutely toothed on the margin, with 3 longitudinal raised lines. India. B.M. 5459.

38. **scabrilíngue,** Lindl. Pseudobulbs stout, erect, slightly attenuated below, 9–12 in. high: lvs. oblong: fls. 1½ in. in diam., in fascicles from the uppermost joints of the stems; sepals and petals similar, sub-equal, ovate-lanceolate, ivory white; labellum 3-lobed; lateral lobes oblong, erect, yellow-green; midlobe oval-oblong, reflexed, yellow, with 5–7 orange-yellow sunken lines on disk; spur small, conical. Burma.

39. **Lówii,** Lindl. Pseudobulbs slender: sepals and petals pale yellow; labellum marked on the side lobes and midlobe with crimson. Borneo. B.M. 5303. F.S. 23:2395.

BB. *Pseudobulbs not black-hairy, upright.*

C. *Leaves persistent.*

D. *Petals and sepals white.*

40. **Japónicum,** Lindl. (*D. monilifórme*, Swartz). Pseudobulbs tufted, 6–12 in. long, attenuated below: lvs. linear-lanceolate, acute: fls. fragrant, 1½ in. across, solitary or in pairs, white, dotted or speckled with mauve at the base of the labellum. S. Jap.

DD. *Petals and sepals yellow.*

41. **capíllipes,** Reichb. f. Dwarf, tufted plants, with fusiform pseudobulbs: lvs. lanceolate: fls. in pairs or solitary, golden yellow, with a deeper blotch on the labellum. India.

42. **lutèolum,** Batem. Pseudobulbs erect, about 1½ ft. long: lvs. linear-lanceolate, acute: fls. about 2 in. across, yellowish or cream-white; labellum with a few reddish lines. Burma. J.H. III. 32:143. G.C. II. 19:340 (var. *chlorocentrum*).

DDD. *Petals and sepals rose-color.*

43. **nóbile**, Lindl. Fig. 691. Stems stout: lvs. oblong: sepals and petals white, suffused with rose at the apices; labellum white, with a blotch of amethyst-purple at distal end, throat dark crimson. Himal., China. G.C. II. 11:565; Ill. 23:341. J.H. III. 34:295. R.B. 23:25. A.F. 4:415; 13:620.

Var. **nobilius**, Hort., has larger fls., which are more intense in color, the sepals and petals pale only at the base. I.H. 42:36.

Var. **Cooksoniànum**, Hort., is a pelorian form, the petals having acquired at the base the rich coloring so characteristic of the labellum. Gn. 55, p. 445.

Var. **Balleànum**, Hort. Sepals and petals white; labellum yellowish, with pale crimson blotches on either side of the throat. Sikkim.

691. Dendrobium nobile.

D. Àinsworthii, Moore, is a beautiful and popular hybrid of *D. heterocarpum* and *D. nobile*. Blossoms in small, lateral racemes; sepals and petals white; lip with a feathered, purple blotch, white. Gn. 51, p. 338. G.C. II. 16:624.

44. **Linawiànum**, Reichb. f. Stems long, clavate: lvs. narrow, several inches long: sepals oblong; petals ovate, white at base, otherwise rosy mauve; distal end of labellum pale mauve, anterior portion white, with 2 mauve spots. China, Jap. B.M. 4153.

45. **Párishii**, Reichb. f. Stems thick: lvs. oblong-lanceolate: sepals and petals rose-mauve; labellum orbicular, amethyst-purple, blotched on each side with maroon. Burma. B.M. 5488.

46. **Findleyànum**, Parish & Reichb. f. Stems shining, yellowish, internodes slender: lvs. oblong-lanceolate: fls. large, in pairs; lateral sepals and petals overlapping, pale pink-lilac; labellum yellow margined with white. Burma. B.M. 6438. Gn. 49:1070.

47. **tórtile**, Lindl. Stems clavate, irregular when old: lvs. oblong-lanceolate, about 3 in. long: fls. 3 in. across; sepals and petals pink-lilac; labellum pale yellow, with a deep crimson blotch in the throat. Burma. B.M. 4477. —Var. **ròseum**, Hort. Fls. delicate rose color. The next is very similar.

CC. *Lvs. deciduous.*

48. **álbo-sanguíneum**, Lindl. Stems about 1 ft. high, stout: lvs. linear-lanceolate: fls. 2 or 3 together, 2–3 in. across, whitish; petals streaked with red at the base; labellum with 2 blotches in the middle. Burma. A.F. 11:1350. B.M. 5130.

49. **rhodopterýgium**, Reichb. f. Pseudobulbs cylindric, erect, about 1 ft. long: lvs. linear-lanceolate: fls. about 2 in. across; sepals oblong-lanceolate; petals ovate, both pale purple mottled with white; labellum crimson-purple, striated, bordered with white. Burma.—Supposed natural hybrid between *D. Parishii* and *D. Pierardi.*

BBB. *Pseudobulbs drooping.*

C. *Lvs. persistent: fls. yellow.*

50. **heterocárpum**, Wall. (*D. aùreum*, Lindl.). Stems erect, attenuated at base, or nearly so: lvs. oblong-lanceolate: sepals and petals pale yellow; labellum orange-yellow, blotched and streaked with crimson. Assam, Khasia Hills, Nepal, Philippine Isls. B.M. 4708.

51. **Rúckeri**, Lindl. Pseudobulbs slender, about 1½ ft. long, attenuated below: lvs. linear-lanceolate: fls. either solitary or in pairs; lateral sepals triangular; sepals and petals yellowish; labellum with white lateral lobes streaked with rose, yellow. Philippine Isls.

52. **lasioglóssum**, Reichb. f. Pseudobulbs about 1½ ft. long, attenuate above and below: lvs. lanceolate: fls. 1½ in. across, in 2's or 3's, white; lateral lobes of labellum lined with red. Burma.

53. **áqueum**, Lindl. Pseudobulbs decumbent: lvs. ovate-oblong: fls. solitary or in pairs, yellowish white, with a yellow disk on the labellum; upper sepal elliptic-oblong, acute; lateral sepals falcate; petals ovate. Nilghri Hills, India.

CC. *Leaves deciduous.*

D. *Flowers yellow.*

54. **chrysánthum**, Lindl. (*D. Páxtonii*, Lindl.). Pseudobulbs slender, tall, flexuose, leafy to the base. lvs. ovate-lanceolate: fls. yellow; sepals oblong; petals broader, oval, denticulate; labellum orbicular, fringed, throat maroon-purple, base infolding the column. Burma. B.R. 15:1299. G.C. III. 15:565.

55. **ochreàtum**, Lindl. Pseudobulbs with swollen joints: lvs. narrowly-ovate: fls. in pairs; sepals and petals about equal, golden yellow; labellum orbicular-concave, yellow, with maroon-purple blotch. India. B.M. 4450.

DD. *Fls. white or pinkish.*

E. *Labellum glandular, ciliate.*

56. **Lóddigesii**, Rolfe (*D. pulchéllum*, Lodd.). Habit dense, dwarf: stems very slender, 3–4 in. long: lvs. oblong-lanceolate: fls. on slender pedicels, solitary; sepals and petals pale pink or rose-lilac; labellum with an orange-yellow disk bordered with rose-lilac. India. Not *D. pulchellum*, Roxburgh, for which species it often passes in gardens. B.M. 5037.

57. **Devoniànum**, Paxt. Stems pendulous, about 3 ft. long: lvs. linear-lanceolate: sepals and petals white,

tipped with amethyst-purple; labellum cordate, with an amethyst-purple blotch in front, otherwise white, with 2 orange-yellow blotches in the throat, the margin delicately fringed. Khasia Hills. B.M. 4429. J.H. III. 34:197. G.C. III. 7:680.

EE. *Labellum not glandular, ciliate.*

F. *Pseudobulbs conspicuously nodose.*

58. **amœnum,** Lindl. Pseudobulbs slender: lvs. linear-lanceolate: fls. usually solitary, otherwise in 2's or 3's; sepals and petals white, tipped with violet-purple; labellum violet-purple bordered with white and blotched with yellow. Nepal. B.M. 6199. G.C. II. 16:625.

59. **Wardiànum,** Warner. Stems 2, 3 or more ft. high, pendent: lvs. oblong-lanceolate: fls. usually 2 or 3 together, 3–4 in. across; sepals and petals tipped with rose-mauve (amethyst-purple); labellum with an apical blotch of same color, otherwise yellow shading into white at the margin, and blotched with maroon in the throat. There is a variety in which the apical blotches are wanting. Burma. B.M. 5058. I.H. 24:277. F.R. 1:231. Gn. 47, p. 84. R.B. 23:25. J.H. III. 30:454: 32:237.

60. **crassinòde,** Reichb. f. Stems pendulous or nearly so, 1–2 ft. long, swollen conspicuously at the contiguous internodes: lvs. linear-lanceolate: fls. 2 or 3 together, about 2 in. across; sepals and petals white, tipped with rose-mauve; labellum similarly tipped with rose-mauve, otherwise yellow with a white border. Burma. B.M. 5766.—Var. **Barberiànum,** Hort., is a stronger-growing form of the species, with brighter colored fls., the coloring at the tips of the petals covering more surface.

61. **Bóxallii,** Reichb. f. Pseudobulbs pendulous, about 30 in. long: lvs. linear-lanceolate, acute: fls. 2½ in. across, usually in pairs; sepals and petals white, tipped with pale mauve; labellum yellowish, bordered with white, tipped with pale mauve. Burma.

62. **Fálconeri,** Hook. Stems slender, knotted, branching above: lvs. linear: fls. solitary, about 3 in. across; sepals and petals white, tinged with rose and tipped with amethyst-purple; labellum spreading in front, maroon-purple, with 2 deep orange blotches, tipped with amethyst-purple, bordered with white. India. B.M. 4944. I.H. 23:243.—Var. **giganteum,** Hort., is a stronger-growing form of the species, with larger fls.

63. **Aphrodite,** Reichb. f. Pseudobulbs 6–12 in. tall: lvs. linear-lanceolate: fls. 2 in. across, often in pairs; sepals whitish; petals similarly colored; midlobe of labellum large, yellowish, with 2 maroon blotches at base. Burma.

FF. *Pseudobulbs not conspicuously nodose.*

G. *Lip yellow at base.*

64. **gratiosissimum,** Reichb. f. Pseudobulbs slender at base, thickened above, swollen at the nodes: lvs. lanceolate: fls. in 2's or 3's, from the leafless stem, about 2 in. across; sepals and petals white, tipped with pale crimson-purple; labellum white, blotched with crimson-purple at the apex and marked with yellow on the disk. Burma.

65. **crystallinum,** Reichb. f. Stems about 1 ft. long, slender, striated, nearly pendulous: lvs. narrow: fls. in pairs or solitary; sepals and petals white, with amethyst-purple apices; labellum yellow, with an amethyst blotch on front, margin whitish. Burma. B.M. 6319.

66. **crepidàtum,** Lindl. Stems 1 ft. long, slender, striated: lvs. linear-lanceolate: fls. 2 or 3 in a group, about 1 in. across, white, tinted with lilac; labellum yellow, with a white border. Assam. B.M. 4993.—Var. **róseum,** Hort., occurs in catalogues.

67. **Bénsoniæ,** Reichb. f. Pseudobulbs cylindric: lvs. linear: fls. 2½ in. across, in 2's or 3's, white, disk of labellum orange-yellow, with 2 maroon spots at base. British Burma. B.M. 5679. I.H. 35:47.—Var. **màjus,** Hort., is a larger-fld. form.

GG. *Lip not yellow at base.*

68. **supérbum,** Reichb. f. (*D. macrophýllum,* Hort.). Stems stout, pendent: lvs. ovate: sepals lanceolate; petals ovate-lanceolate, delicate rose-mauve; labellum of same color, with deep crimson-purple throat. Philippine Isls. B.M. 3970.—Var. **anósmum,** Hort. Fls. scentless or nearly so, mostly solitary; sepals and petals shorter, not undulate. J.H. III. 28:275 (var. *Houttoni*). Var. **giganteum,** Hort. Fls. larger.

69. **lituiflòrum,** Lindl. Stems about 2ft. long, greyish: lvs. linear: fls. in pairs or sometimes 4 or more in each group, amethyst-purple; sepals oblong-lanceolate; petals ovate-oblong; labellum funnel or trumpet-shaped, deep maroon, anterior portion white. Burma. B.M. 6050.—Var. **Freemanii,** Hort. Labellum with a pale yellow zone, sepals and petals deeper colored than in the type. Very similar in habit to *Dendrobium nobile,* but more slender.

70. **MacCárthiæ,** Thwaites. Fls. bell-shaped, rosy mauve and white; sepals and petals only slightly spreading; labellum pale mauve, striped and blotched with purple, a maroon spot on the disk: racemes pendulous. India. B.M. 4886.

71. **transpàrens,** Wall. Pseudobulbs slender: lvs. linear-lanceolate: fls. 1½ in. across, in 2's and 3's; sepals white, tinted with pale mauve; petals similarly colored: labellum white with mauve spots, tinted with mauve at the apex. India. B.M. 4663.

EEE. *Labellum cucullate, wholly or in part, pale sulfur yellow.*

72. **primulinum,** Lindl. Stems drooping, slender, about 1 ft. long, greyish: sepals and petals about equal, pink-lilac; labellum yellow with deep crimson margin. Nepal. B.M. 5003 (as *D. nobile,* var.).—Var. **gigantéum,** Hort. Pseudobulbs longer and more slender: fls. much larger.

73. **Pierárdi,** Roxb. Stems long, slender, pendulous: lvs. ovate-lanceolate: sepals and petals pink-lilac; labellum yellow, marked with deep crimson at base. Burma. B.M. 2584. Gn. 55, p. 405.—Var. **latifòlium,** Hort., is very similar to this.

74. **cretàceum,** Lindl. Stems about 1 ft. long: lvs. oblong-lanceolate: fls. solitary, whitish, disk of labellum yellowish, with crimson marking, margin fringed. Khasia Hills.

Hybrids: *D. Ainsworthii* = D. heterocarpum × D. nobile (see No. 42).—*D. Dominianum* = D. nobile × D. Linawianum.—*D. Cassiope* = D. Japonicum × D. nobile, var. albiflorum.—*D. splendidissimum* = D. aureum × nobile.—Var. *grandiflorum* = D. aureum × nobile.

D. Johannis, Reichb. f., and *D. robustum* are not in cult. in the United States, but have appeared in trade catalogues.

OAKES AMES.

DENDROCÁLAMUS. Consult *Bamboo.*

DENDROCHÌLUM. Compare *Platyclinis.*

DENDRÒMECON (Greek *dendron,* tree; *mecon,* poppy). The only genus of *Papaveràceæ* known to have woody stems. California. Probably only one species. **D. rígidum,** Benth. Dry, rocky hills of the Coast Range, mainly in the south: 3–10 ft. high: stems up to 1 in. thick: bark whitish: branches stiff, erect: lvs. linear-lanceolate, not cut, coriaceous, reticulately veined, very acute and mucronate: fls. bright yellow, 1–3 in. in diam., on pedicels 1–4 in. long: capsules linear, nerved, 1½–2½ in. long; seeds black, almost globular. Hardy in some parts of England. Propagated from seeds, that take very long to germinate. B.M. 5134. F.S. 14:1411. Gn. 50:1087. J.H. III. 29:92.—**D. Hárfordii,** Kell., and **D. fléxile,** Greene, from Santa Cruz and Santa Rosa Islands, are now considered as forms of above, varying mainly in the habit, more drooping and graceful, and in the much larger, ovate, more glaucous leaves. These different forms occur also in the mountains near Santa Barbara. Considerable variation in size of flowers appears to depend mostly upon the conditions where plants are growing. Outdoor shrubs.

F. FRANCESCHI.

DENDROPÀNAX (Greek, *tree Panax*). *Araliàceæ.* A genus of about 20 trees and shrubs from tropical America and Asia, also China and Japan. **D. Japonicus,** Seem., may be obtained from dealers in Japanese plants. The leaves have been compared to *Fatsia Japonica,* but are smaller and mostly 3-lobed. The floral parts are in 5's. Berry globose.

DENDROPHÝLAX (Greek, *growing on a tree*). *Orchidàceæ*, tribe *Vándeæ*. Epiphytes: sepals and petals spreading, labellum 3-lobed, lateral lobes small, angular, middle one with spreading lobes; spur long, filiform: column short; pollinia 2. Near Phalænopsis. The following are introduced into American horticulture:

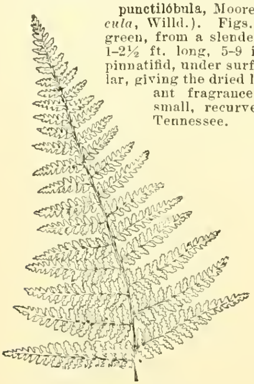
Lindenii, Reichb. f. Scape leafless, bearing a single white flower: sepals and petals lanceolate; divisions of midlobe of labellum lanceolate: capsule smooth. On *Oreodoxa Regia*, and live oaks, S. Florida.

funàlis, Hort. (*Œceoclàdes funàlis*, Lindl. *Angræcum funàle*, Lindl.). Leafless, roots numerous, fleshy: peduncles 2-fld.: fls. white; sepals and petals oblong-lanceolate; labellum 3-lobed, with a long horn. Mts. of Jamaica.

Oakes Ames.

DENNSTǼDTIA (a personal name). *Polypodiàceæ*. A genus of hardy or greenhouse ferns of wide distribution, often referred to Dicksonia but belonging to a different family from the antarctic or southern hemisphere tree ferns of the latter genus. Indusium inferior cup-shaped. For culture, see *Dicksonia*

punctilóbula, Moore (*Dicksònia pilosiúscula*, Willd.). Figs. 692, 693. Lvs. light green, from a slender, creeping rootstock, 1–2½ ft. long, 5–9 in. wide, usually tripinnatifid, under surface minutely glandular, giving the dried lvs. a somewhat pleasant fragrance; sori minute, on small, recurved teeth. Canada to Tennessee.



692. Tip of leaf of Dennstædtia punctilobula.

693. Fruiting lobe of Dennstædtia punctilobula.

Smíthii, Moore. Lvs. thick, the under surface almost woolly, glandular, tripinnate; lower pinnæ 9–12 in. long, 3–4 in. wide; sori 2–8 to each segment. Philippines.

dissécta, from the West Indies, often 6–7 ft. high, with broad (2–4 ft.) lvs. is sometimes seen in cultivation, and is well worth a place in the trade.

L. M. Underwood.

DENTÀRIA (Latin, *dens*, tooth; referring to the toothed rootstocks). *Cruciferæ*. Toothwort. Dealers in native plants sometimes cultivate a few of these hardy herbaceous perennials, which have pleasant tasting rootstocks, 2 or 3 lvs., mostly with 3 leaflets, and corymbs or racemes of large white or purplish fls. in spring. The European and eastern American species are readily told from Cardamine by habit and many obvious differences, but the western American of the two genera converge so that some botanists have merged Dentaria into Cardamine. (See E. L. Greene, Pittonia, 3:117–124.) The genus contains no arctic or alpine forms. About 9 species are cultivated in Old World rockeries. They are of easy culture in light, rich soil and moist, shady positions. Usually prop. by division, as seeds are not abundant.

A. *Rootstock not tuberous.*

diphýlla, Michx. Pepper-root. Rootstock several in. long, often branched, strongly toothed at the many nodes: stem-lvs. 2, similar to the root-lvs., close together; leaflets 3, ovate or oblong-ovate, coarsely crenate, the teeth abruptly acute: petals white inside, pale purple or pinkish outside. Nova Scotia to S. C., west to Minn. and Ky. B.M. 1465.—Rootstocks 5–10 in. long, crisp, tasting like water-cress. Pretty spring flower.

AA. *Rootstock tuberous.*

B. *Lvs. 3-parted, but not into distinct leaflets.*

C. *Tubers usually not jointed or prominently tubercled.*

laciniàta, Muhl. Tubers deep-seated: stem-lvs. 2 or 3, with lateral segments often 2-lobed, all broadly oblong to linear, more or less sharply toothed: petals pale rose to white. Quebec to Minn., south to Fla. and La.

CC. *Tubers with joints about 1 in. long.*

macrocárpa, Nutt. (*C. gemmàta*, Greene). Lvs. 1–3, palmately or pinnately 3–5-parted or divided, segments linear to oblong, entire: fls. purple or rose. N. Calif. to B. C.

BB. *Lvs. cut into 3 distinct leaflets.*

C. *Leaflets linear, entire.*

tenélla, Pursh. Tubers small, irregular: stem-lvs. 1 or 2, nearly sessile, sometimes bulbiferous; leaflets linear-oblong or linear, obtuse, entire: petals rose. Washington.

CC. *Leaflets not linear or entire.*

Califórnica, Nutt. Tubers mostly small: stem ½–2 ft. high: lvs. very variable; stem-lvs. 2–4, mostly short-petiolate, and above the middle of the stem, with 3–5 leaflets, rarely simple or lobed; leaflets mostly short-petiolulate, ovate to lanceolate or linear, entire or toothed: petals white or rose. Mts. of Calif. and Ore.

máxima, Nutt. Tubers near the surface jointed, strongly tubercled: stem-lvs. 2 or 3, usually alternate; leaflets ovate or oblong-ovate, coarsely toothed and somewhat cleft or lobed. Vt. to western N. Y. and Penna.

W. M.

DEODAR. *Cedrus Deodara.*

DEPÀRIA (Greek, *depas*, a beaker or chalice; referring to the form of the involucre). A small genus of Hawaiian and South American ferns related to Dennstædtia, rarely seen in cultivation in America. The sori are marginal and usually on stalked projections from the margin of the leaf.

L. M. Underwood.

DÉRRIS (Greek, *a leather covering*). *Leguminòsæ*. A genus of tropical, tall, woody climbers, one of which is cult. in S. Calif. About 35 species, mostly Asian. Lvs. alternate; lfts. opposite, the odd one distant; stipules none: fls. violet, purple or white, never yellow.

scándens, Benth. Climbing: lfts. 9–13, 1½–2 in. long, oblong, obtuse, muticous or retuse, glabrous or minutely pilose beneath: racemes 4–6 in. long, unbranched: fls. purple: pod long, lanceolate acute at both ends, narrowly winged at the base; ovules 6–8. S. Asia and Indian Archipelago.—It has been offered in this country, but has not been successfully cultivated. The above description is made from specimens contributed by Dr. Franceschi, Santa Barbara, Calif.

DESCHÁMPSIA (after Deschamps, a French botanist). Perennial grasses with small, shining spikelets, like Trisetum and Aira. The plants are usually stouter and the spikelets longer than in Aira, from which it differs in the prolongation of the rachilla. Lvs. flat or convolute: spikelets 2- (rarely 3-) fld., in terminal, usually spreading panicles: awn slender, twisted below. Species about 20, inhabiting cold and temperate regions, a few occurring in the high mountains of the tropics. About 8 species are found in N. America.

cæspitòsa, Beauv. (*Aira cæspitòsa*, Linn.). Tufted Hair-Grass. Hassock-Grass. A native perennial having a tendency to form tufts or tussocks. Panicle pyramidal or oblong, 2 in. long; rays slender, bearing spikelets above the middle; awn variable in length.—Abundant in the Rocky Mt. region, where the tufts help to bind the spongy soil and prevent land-slides. In England it is sometimes used by the farmers to make door mats. Also used for ornament.

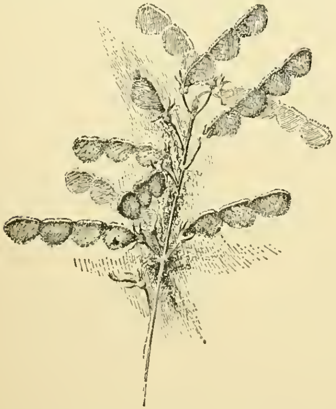
flexuòsa, Trin. (*Aìra flexuòsa*, Linn.). Wood Hair-Grass. A slender, perennial grass, 1–2 ft. high, with numerous very fine root-lvs., and a delicate capillary panicle. It grows in tufts like the above, and can be distinguished by the much longer and twisted awn. N. Amer., Eu.—Valuable for woodland pastures, as it will grow well in the shade. Also used for ornament.

P. B. Kennedy.

DESIGN. The "design-work" of florists refers to formal arrangement of material as opposed to informal arrangement of cut-flowers. Funeral designs are perhaps the commonest. Dried grasses and everlasting flowers are used in funeral designs. The term design is borrowed from the language of art, and can also be applied to formal styles of bedding as opposed to the informal border. Design work is less popular in America than in parts of the Old World, the distinguishing feature of our floriculture being the general taste for cut-flowers and for their free arrangement. Many pictures of designs may be seen in the florists' trade papers.

DESMAZÈRIA. See *Demazeria*.

DESMÒDIUM (Greek, a *band* or *chain;* referring to the jointed pods). By some called *Meibomia*. *Leguminòsæ*. Tick Trefoil. Mostly herbs, of 150 or more species, in temperate and warm regions of America, Asia, Africa and Australia. Lvs. pinnate, with 3–5 (rarely 1) leaflets: fls. small and papilionaceous, in terminal or axillary racemes in summer, mostly purple: pod flat, deeply lobed or jointed, the joints often breaking apart and adhering to clothing and to animals by means of small hooked hairs. Fig. 694. A number of species are native to N. America, and are sometimes grown in the hardy border, where they thrive under ordinary conditions. One hothouse species, *D. gyrans*, is sometimes cult. for its odd moving leaflets. *D. penduliflorum* and *D. Japonicum* will be found under Lespedeza. Several of the native species are worthy of cult., but are practically unknown in the trade. The following have been offered by collectors: *Canadense*, DC.; *cuspidatum*, Hook.; *Dillenii*, Darl.; *Marilandicum*, Boott; *nudiflorum*, DC.; *paniculatum*, DC.; *pauciflorum*, DC.; *sessiliflorum*, Torr. & Gray. The Florida Beggar-weed is *Desmodium tortuosum*, DC., of the W. Indies. It is coming into prominence in the south as a forage plant (see Farmers' Bull. 102, U. S. Dept. of Agric.).



694. Loments or pods of Desmodium Canadense.

gỳrans, DC. Telegraph Plant. From 2–3 ft. high, with 3 oblong or elliptic leaflets, the small lateral ones (which are almost linear) moving in various directions when the temperature is congenial, and especially in the sunshine: fls. purple or violet, in a many-fld. panicle. S. Asia. Grown occasionally as a curiosity, particularly in botanical collections. See Darwin's Power of Movement in Plants, and various botanical treatises, for fuller accounts.

Desmodium gyrans is of tolerably easy culture. It requires stove temperature, and, although a perennial, it is best treated as an annual. The best method of propagation is by seeds. These should be sown in February in a light, sandy soil, in 4-in. pots, and placed in a warm, close atmosphere, where they will soon germinate. The seedlings should be potted singly into small pots as soon as large enough to handle, and be grown on as rapidly as possible, using a mixture of good, fibrous loam and leaf soil in about equal proportions. By midsummer they will be bushy plants, and, though not showy, they will be very interesting.

L. H. B. and Edward J. Canning.

DEÙTZIA (named by Thunberg in honor of his friend and patron, Johann van der Deutz). *Saxifragàceæ*. Very ornamental shrubs with showy white or blush fls. appearing in spring or early summer. Lvs. deciduous, opposite, petioled, serrate, usually with rough stellate pubescence: fls. in racemes or corymbs, white, sometimes purplish, epigynous; calyx-teeth 5; petals 5; stamens 10, rarely more, shorter than the petals; filaments usually winged and toothed at the apex: capsule 3–5-celled, with numerous minute seeds. About 15 species in E. Asia and Himalayas and 1 in Mexico. *D. parviflora* and *D. Lemoinei* are the hardiest, but *D. scabra*, *Sieboldiana* and *gracilis* are also hardy north in somewhat sheltered positions or with slight protection, while most of the others are more tender and can not be grown safely north of New York. The Deutzias thrive in almost any well drained soil, and are well adapted for borders of shrubberies. Potted plants forced with a temperature not exceeding 50° develop into beautiful specimens for the decoration of greenhouses and conservatories, especially *D. Lemoinei*, *D. gracilis* and *discolor*. The same plants cannot be forced again. Prop. readily by greenwood and hardwood cuttings, also by seeds sown in pans or boxes in spring.

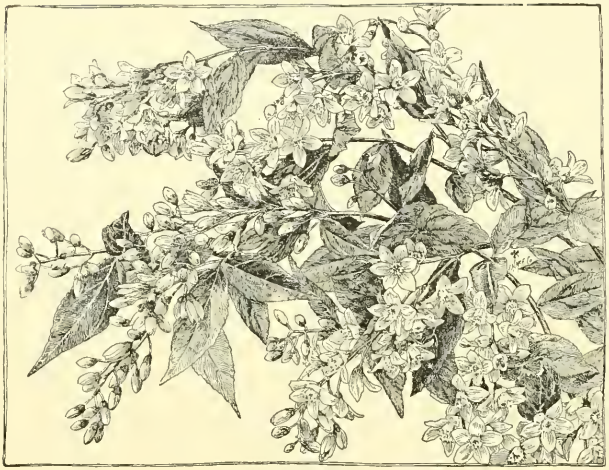
A. *Fls. in racemes or panicles: petals valvate in the bud.*

B. *Longer filaments narrowed toward the apex, without teeth.*

Sieboldiàna, Maxim. (*D. scàbra*, Sieb. & Zucc.). Low shrub, to 2 ft.: lvs. short-petioled, the pair below the panicle sessile, ovate or ovate-elliptic, rounded or cordate at the base, rough and rugose above, stellate-pubescent beneath, light green, 1–2 in. long: panicles erect, loose, 2–3 in. long: fls. white, rather small, with spreading petals; calyx lobes persistent. June. Japan. S.Z. 7.—Graceful low shrub, but less showy than the two following species.

BB. *All filaments with 2 large teeth below the anthers.*

scàbra, Thunb. Shrub, to 6 ft.: lvs. all petioled, ovate to ovate-lanceolate, rounded at the base, crenate-dentate, with rough pubescence on both sides, dull green, 1–3 in. long: panicles erect, 2–4 in. long: fls. white or blushed, with erect petals; calyx lobes deciduous. June, July. Japan, China. S.Z. 6. B.M. 3838. B.R. 20:1718. S.B.F.G. II. 4:393. A.G. 18:356. Var. **angustifòlia**, Voss. Branches reddish brown: lvs. ovate-lanceolate, rougher. Var. **crenàta**, Voss (*D. crenàta*, Sieb. & Zucc.). Branches brown: lvs. ovate or oblong-ovate, less rough. This var. is less common in cultivation than the former. Var. **marmoràta**, Hort. Lvs. spotted with yellowish white. Var. **plèna**, Maxim. With double fls. R.H. 1867:70. F.S. 17:1799; 18:1850. I.H. 11:389.—Cult. in different forms as Candidissima, with pure white double fls. (A.F. 6:263. J.H. III. 34:153. G.C. II. 18:173); Pride of Rochester, with very large white double fls.; Purpurea Plena, double outside purplish; Watereri, with large double fls., tinged rose.



695. Deutzia gracilis (× ½).

grácilis, Sieb. & Zucc. Fig. 695. Shrub, to 3 ft., with slender, often arching branches: lvs. oblong-lanceolate, acuminate, sharply serrate, with sparse stellate hairs above, nearly glabrous beneath, bright green, 1–2 in. long: fls. pure white, in racemes; petals erect or somewhat spreading, oblong; stamens much shorter than the petals; calyx-teeth persistent. May, June. Japan. S.Z. 8. P.F.G. 2, p. 7. F.S. 6:611. R.H. 1891, p. 203. There are vars. with yellow and with variegated lvs.; see, also, *D. rosea* (Suppl. list).

AA. *Fls. in corymbs.*

díscolor, Hemsl. Shrub, to 7 ft.: lvs. oblong-lanceolate, denticulate, dark green above, much paler beneath, coated with stellate hairs, sparingly above, densely beneath: corymbs loose, 10–20 fld.: fls. white, with spreading petals, valvate in the bud; filaments with large teeth. China. Var. **purpuráscens,** Franch. Three–4 ft.: lvs. ovate, less stellate-hairy, 1–2 in. long: corymbs rather few-fld.: petals pinkish outside; calyx red, with large teeth. June. China. R.H. 1895:64. G.F. 7:287. G.C. III. 26:45.

Lemóinei, Hort. (*D. grácilis* × *parviflòra*). Fig. 696. Spreading shrub, to 3 ft.: lvs. elliptic-lanceolate, finely serrate with appressed teeth, with sparse stellate hairs above, nearly glabrous beneath, 1½–3 in. long: fls. in large corymbs or broad panicles, pure white; petals broadly ovate, spreading, partially valvate and partially imbricate in the bud; filaments with large teeth. G.F. 9:285. A.F. 11:457. Gt. 44, p. 567 and 46, p. 383. Gng. 4:135. J.H. III. 34:77. G.C. III. 18:389. Gn. 48, p. 317. —A very desirable shrub, more vigorous and with showier fls. than *D. gracilis*. Excellent for forcing.

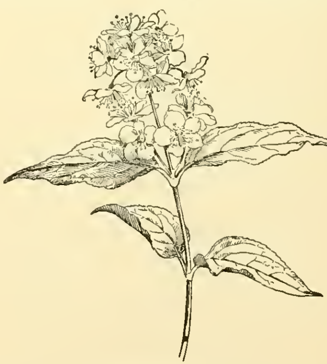
parviflòra, Bunge. Shrub, to 6 ft., with erect branches: lvs. ovate or oblong-ovate, finely serrate, with stellate hairs on both sides, often grayish green beneath, 2–3 in. long: fls. in many-fld. corymbs; petals roundish obovate, spreading, imbricate in the bud; longer filaments without teeth. June. N. China, Mongolia. G.F. 1:365. Gt. 11:370; 43, p. 65 and 46, p. 382. R.H. 1892, p. 223. G.C. III. 14:153.

D. angustifòlia, Dipp.=D. Lemoinei.—*D. Brunoniàna,* R. Br. =D. staminea var.—*D. corymbiflòra,* Lem. Shrub, to 4 ft.: lvs. ovate-lanceolate, denticulate, pubescent beneath: corymbs many-fld.: petals spreading. June, July. China. R.H. 1897, p. 466 (as D. corymbosa) and 1898, p. 402. G.C. III. 24:267. A.F. 14:166. Gng. 7:2.—*D. corymbòsa,* R. Br. Allied to D. parviflora: lvs. ovate or lanceolate, long acuminate: fls. larger; all filaments toothed. Himalayas.—*D. dentàta,* Hort.=D. scabra.—*D. Fórtunei,* Hort. (D. scabra × Sieboldiana). Lvs. ovate-oblong: fls. large, pure white: filaments partly indistinctly toothed. Usually a variety of D. scabra is cult. under this name.—*D. mìtis,* Hort.=D. scabra, var. crenata.—*D. ròsea,* Hort. (D. gracilis rosea, Lemoine). Hybrid between D. discolor purpurascens and D. gracilis, with campanulate blush fls. in panicles. Of the same parentage as are var. campanulata and var. venusta, with white, and var. grandiflora with large blushed fls. These vars. are described by Lemoine as forms of D. gracilis, except var. grandiflora, which he has under D. discolor.—*D. stamínea,* B. Br. Shrub, to 3 ft.: lvs. ovate or ovate-lanceolate, with whitish stellate pubescence beneath: corymbs many-fld.: fls. white, fragrant; filaments with large teeth. Himalayas. B.R. 33:13. Var. Brunoniana, Hook. f. & Thoms. Lvs. less densely pubescent: fls. larger. B.R. 26:5 (as D. corymbosa).—*D. Setchuénsis,* Franch. Shrub: lvs. ovate-lanceolate, bright green above, whitish beneath, with appressed stellate hairs: corymbs few-fld.; filaments toothed, half as long as petals. China.—*D. Wátsoni* and *Wéllsi,* Hort.=D. scabra vars.

Alfred Rehder.

DEVIL-IN-A-BUSH. *Nigella.*

DEWBERRY. The Dewberry is one of the most recent acquisitions among garden fruits. As a cultivated fruit, it is American, and the varieties are forms of native species. It is distinguished from the blackberry chiefly by its low, trailing habit, its method of propagating by tips instead of suckers, and its few-flowered cymose clusters. Four distinct species are found in cultivation. (1) The northern Dewberry (*Rubus villosus,* Ait., until lately known as *R. Canadensis*). In this species the leaflets are thin and deciduous, the stems sparsely and lightly prickly, and the flower-stalk slightly fuzzy but not glandular. A well marked sub-type has been set off from this species, comprising the Lucretia Dewberry



696. Deutzia Lemoinei (× ⅓).

(var. *roribaccus*, Bailey), which is a stronger plant, with wedge-ovate, jagged leaflets, long flower stalks, large flowers and leaf-like sepals. Figs. 697, 698. (2) The Bartel type (*R. invisus*, Bailey), with stout, stiff stems, straight, reflexed prickles, large leaflets with simple teeth, and having the unopened buds surmounted by a tip formed by the sepals which clasp around it. (3) The southern Dewberry (*R. trivialis*, Michx.). This has round, shrubby, trailing stems, bearing strongly recurved or reflexed prickles, glandular-tipped hairs and bristles. The leaves are evergreen, leathery and smooth, with numerous stout, recurved or reflexed prickles on the veins and petioles as well as on the flower-stems. It is represented in cultivation by the Manatee and a few others. (4) The western Dewberry (*R. vitifolius*, Cham. & Schlecht.). This has round, woody stems, usually weak and trailing but sometimes upright, the fruiting branches numerous, armed with slender prickles, often rendering the smaller parts densely setose. It includes the Skagit Chief and others. Still another species, better known as the cut-leaved blackberry, has been long in cultivation, chiefly for ornament. Its stems are armed with strong, recurved prickles and its leaves are much parted and divided.

697. Lucretia Dewberry (× ¼).

The culture of the Dewberry is much the same as that of the blackberry, except in the matter of training, though it is thought to thrive better on light and sandy soils than the blackberry. No summer pruning of the canes is needed, although the old canes may be removed as soon as done fruiting. Various methods of training are employed, the object of all being to keep the bearing canes off the ground, so that they will not interfere with cultivation and the fruit will be kept clean. For this purpose the single stake and the wire trellis methods are best known. Tying the canes to stakes (Fig. 699) is perhaps the best method. The fruiting canes are tied to the stake or trellis in spring, being shortened to from 3 to 5 feet in length. The young canes are allowed to grow upon the ground at will, or at most are turned in the direction of the row if they interfere with cultivation. They remain in this position during winter, where they can be very conveniently protected, and take their place upon the trellis or stakes the following summer.

The Dewberries have proved successful and profitable with some and a failure with others. Different varieties should be planted together to insure proper fecundation of the blossoms. Their chief value lies in their season of ripening, which is in advance of the blackberries. Lucretia and Bartel are the most important varieties.

For history and botany, see Bailey, Evolution of Our Native Fruits; for culture, see Card's Bush-Fruits, and Cornell Bulletins 34 and 117. Consult *Blackberry*, *Loganberry* and *Rubus*.

FRED W. CARD.

DIACRIUM (*through* and *point;* the stems are surrounded by sheaths). *Orchidàceæ*, tribe *Epidéndreæ*. Four tropical Amer. epiphytes, closely allied to Epidendrum, with which they have been included. Differs from that genus in the fact that the column and lip are not united. Fls. showy, in loose racemes: lvs. few, sheathing: pseudobulbs slender. Culture of Epidendrum and Cattleya.

bicornùtum, Benth. (*Epidéndrum bicornùtum*, Hook.). Pseudobulbs 1–2 ft. long, hollow, bearing dry sheaths: lvs. short and leathery: raceme slender, 3–12-fld.: the fls. white, with small crimson spots on the 3-lobed lip, fragrant. B.M. 3332. G.C. III. 16:337. J.H. III. 33:29. —A handsome orchid, requiring high temperature.

D. bidentàtum, Hemsl. (*Epidéndrum bidentàtum*, Lindl.), of Mexico, has been listed in trade catalogues, but it is practically unknown to cult., and is probably not now in the Amer. trade.

L. H. B.

DIAMOND FLOWER. See *Ionopsidium*.

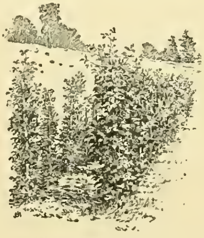
DIANÉLLA (diminutive of Diana). *Liliàceæ*. Tender perennial fibrous-rooted plants, with hard, linear, sheathing, grass-like lvs., often 2–3 ft. long, large, loose panicles of blue fls. on delicate, pendent pedicels, and great numbers of pretty blue berries, which remain attractive for several weeks, and are the chief charm of the plant. There are about a dozen species of world-wide distribution. They perhaps succeed best in the open border of a cool greenhouse. Prop. by divisions, or by seeds sown in spring in mild heat. A few plants have lately been imported, but the species are not advertised. Latest monograph by J. G. Baker, in Journ. Linn. Soc. 14:574 (1875).

A. *Stems entirely wanting.*

B. *Anthers 1 line long.*

Tasmánica, Hook. Height 4–5 ft.: lvs. numerous, in a rosette, broadly ensiform, 2–4 ft. long, ¾–1 in. wide, margined with small reddish brown spines, that cut the hand if the leaves are carelessly grasped: panicle very lax, surpassing the lvs. 1–2 ft., with as many as 60 fls.: fls. pale blue, nodding, ½–¾ in. across, segments finally reflexed. Tasmania and Australia. B.M. 5551.

698. Lucretia Dewberry. Natural size.


699. Training Dewberry to stakes.

BB. *Anthers 1½ lines long.*

C. *Veins of the outer perianth-segments rather distant.*

lævis, R. Br. Lvs. 1–1½ ft. long, 6–9 lines wide, less leathery and paler than in *D. cærulea* and at first slightly glaucous: panicle deltoid, the branches more compound than in *D. revoluta:* outer segments of the perianth with 5 distant veins, inner ones densely 3-veined in the middle third. Eastern temperate parts of Australia. B.R. 9:751. L.B.C. 12:1136.

CC. *Veins of the perianth-segments crowded into a central space.*

revolùta, R. Br. Height 2–3 ft.: lvs. in a rosette, 1–1½ ft. long, 3–4 lines wide, dark green, purplish at the base and margin, not spiny at the margin: panicle branches short, ascending: fls. later than *D. cærulea.* W. and E. Australia in temperate parts. Tasmania. B.R. 9:734 and 13:1120.

AA. *Stems present but short.*

cærùlea, Sims. Subshrubby, with a short stem in age, branching: lvs. about 6, clustered at the ends of branches, 9–12 in. long, 6–9 lines wide, dark green, rough on the back and margin: outer perianth-segments with 5 distant veins, inner ones with 3 closer veins. Eastern temperate Australia. B.M. 505.

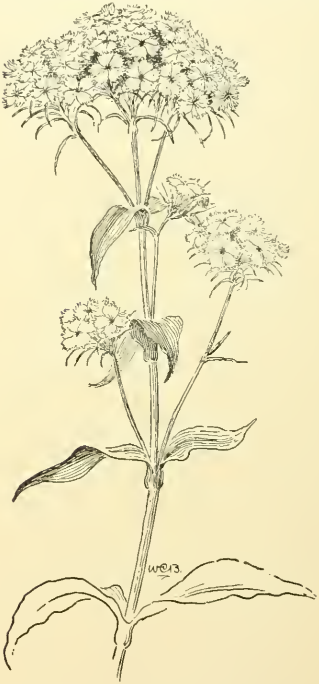
ensifòlia, Red. Caulescent herb, 3–6 ft. high, the lvs. never in a rosette, numerous, hard, linear, 1–2 ft. long, 9–12 lines wide, lighter colored on the keel and margin: fls. blue or greenish white. Trop. Asia, China, Australia, Hawaiian Islands. B.M. 1404. W. M.

DIÁNTHUS (Greek for *Jove's flower*). *Caryophyllàceæ.* PINK. About 200 species of Old World small herbs, many of them prized for their rich and showy flowers. Nearly all of them are perennials; they form tufts and have grass-like lvs., and jointed stems with terminal fls. and opposite lvs. From kindred genera Dianthus is distinguished by the sepal-like bracts at the base of a cylindrical calyx (cf. Figs. 366, 367); petals without a crown; styles 2. They are temperate-region plants. The flowers are usually pink or red, but in garden forms white and purple are frequent colors. Most of the cult. species are hardy in the north and are easy of culture. The perennial species are excellent border plants. The chief care required in their cultivation is to see that the grass does not run them out. Best results in flowering are obtained usually from 2-year-old seedling plants. Two weedy species, *D. prolifer*, Linn., and *D. Armeria*, Linn., are naturalized in the eastern states. Monogr. by F. N. Williams, Journ. Linn. Soc. 29 (1891–3). L. H. B.

Dianthus is essentially a European genus, there being but one species found native on this continent (*D. alpinus*, found in high northern regions and in Europe), though others are escapes from gardens, such as *D. deltoides* and *D. barbatus*. Among the gems of the genus are various pretty little alpine tufted sorts as *D. neglectus*, *D. glacialis* and *D. alpinus*, all of which are of dwarf, close habit, not exceeding 3 in. in height and having very large single flowers of brightest colors. These are suited only for rock gardening, as on level ground they often become smothered with weeds or swamped with soil after a heavy rain storm, and to these two causes are attributable the failures to cultivate them. Dianthuses like a warm soil, and one that will not become too wet at any time, especially in winter, where the perennial kinds are grown, as they are often killed not so much from cold as from too much ice round them. Snow is the best possible protection, but ice is the reverse.

All Dianthuses are readily propagated from seeds sown in rich soil, but the double kinds are reproduced from cuttings alone to be sure to have them true, and in the fall months cuttings are easily rooted if taken with a "heel" or a part of the old stem adhering to the base of the shoot; so that to make cuttings it is best to strip them off rather than to make them with a knife. It will be found also that, if cuttings made from plants growing in the open ground do not root readily but seem to dry up in the cutting bench, if the plants to be increased are carefully lifted and potted, placed in a temperature of say 50° until young growth shows signs of starting, every cutting taken off at this stage will root easily. The transition from outdoors to the propagating house should not be too abrupt. Another method of propagation is by layering, and with the garden Pinks, or forms of *D. plumarius*, it is the easiest and surest. After hot weather is past stir the soil round the parent plant, take the branches that have a portion of bare stem, make an incision half way through and along the stem for an inch, and peg this down in the soil without breaking the shoot off (Fig. 370). Roots will be formed and good strong plants be the result before winter. The layering method is specially suitable to such species as *D. plumarius*, *D. Caryophyllus* and double forms of others, such as Sweet William. E. O. ORPET.

Index: alpinus, 11; *atrorubens*, 2; barbatus, 5; capitatus, 3; Carthusianorum, 2; Caryophyllus, 8; Chinensis, 13; Cincinnatus, 13; cinnabarinus, 1; cruentus, 4; deltoides, 10; *dentosus*, 13; diadematus, 13; glacialis, 12; Heddewigi, 13; hybridus, 13; imperialis, 13; laciniatus, 13; latifolius, 14; macrosepalus, 13; plumarius, 6; *punctatus*, 8; *semperflorens*, 13; *Sinensis*, 13; superbus, 7; sylvestris, 9; viscordalis, sub 14.



700. Sweet William—Dianthus barbatus (× ½).

A. *Flowers in dense cymes or in heads, the cluster often subtended by involucre-like lvs.*

B. *Petals not bearing hairs or barbs: bracts dry.*

1. **cinnabarinus**, Sprun. A ft. high, woody at base, perennial, blooming in Aug. and Sept.: lvs. linear, sharp-pointed and rigid: petals fiery red above, paler beneath, glandular: stamens included. Greece.—Handsome little species; useful for hardy border or rockery.

BB. *Petals with hairs or barbs on the lower part of the blade.*

2. **Carthusianòrum**, Linn. (*D. atròrubens*, Willd.). Hardy perennial or biennial, glabrous, scarcely glaucous, 12–18 in. high, the stem angled: lvs. short, linear and pointed, without prominent nerves when fresh: fls. in a dense, 6–20-fld. head, in shades of red, the petals sharply but not deeply toothed, the cluster subtended

Dianthus barbatus, the Sweet William of all old gardens

by very narrow or even awl-like lvs. Denmark to Portugal and Egypt. B.M. 1775, 2039.—Very variable. Little known in Amer. gardens.

3. **capitàtus**, Balb. Much like the last: plant glaucous, conspicuously pubescent, taller: petals purple-spotted. Siberia, Servia.

4. **cruéntus**, Griseb. Cespitose, glaucous, glabrous: stem 1–2 ft., terete, forking: lvs. linear or lance-linear, sharp acuminate: fls. deep blood-red, small, numerous in a contracted cyme; petals red-hairy towards the base. July. Greece.

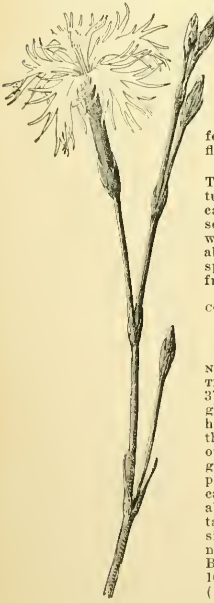
5. **barbàtus**, Linn. Sweet William. Fig. 700. Perennial, but readily grown from seed, and flowering well the second year, glabrous, the stems 4-angled, 10–18 in. high: lvs. broad and flat or conduplicate, 5-nerved: fls. several to many in a round-topped, dense cyme, in many colors, the petals not hairy. Russia to China and S. to the Pyrenees. B.M. 207.—The Sweet William is one of the oldest garden flowers. It is sure to be found in the old-fashioned gardens. The cult. forms run into many colors. Sometimes found along roadsides as an escape. There are double-fld. forms. R.H. 1894, p. 277.

AA. *Flowers solitary, or in 2's or 3's.*

B. *Calyx-bracts short and broad, appressed.*

C. *Petals fimbriate.*

6. **plumàrius**, Linn. Common Grass or Garden Pink. Scotch Pink. Pheasant's Eye Pink. Low, tufty, 1 ft., blooming in spring and early summer, very fragrant: lvs. narrow and short, blue-glaucous: fls. medium size, pink, purplish and white, the blade of the petal fringed one-fourth or one-fifth its depth; calyx cylindrical, with short, broad-topped mucronate bracts. Austria, Siberia.—A universal favorite. Hardy. Much used in old-fashioned gardens as edging for beds. There are double-fld. forms.

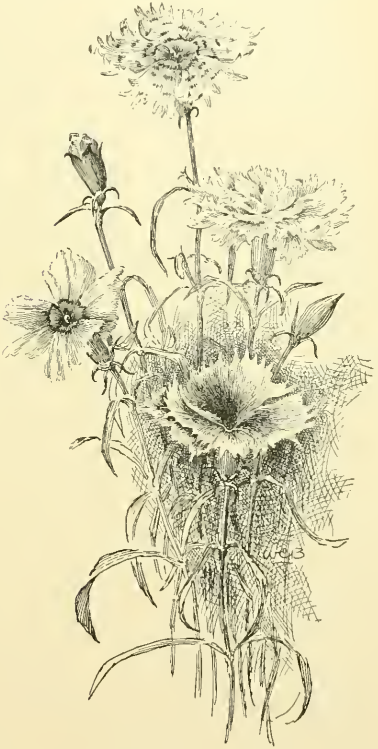


701. Dianthus superbus. (× ½.)

7. **supérbus**, Linn. Fig. 701. Taller, the stems forking, less tufted, later-fld., broader-lvd.; calyx longer: petals lilac, dissected below the middle. Norway to Japan and Spain. Variable. B.M. 297.—A handsome species, growing 16–24 in., fragrant. Perennial.

CC. *Petals only dentate (except in some garden forms).*

8. **Caryophýllus**, Linn. Carnation. Clove Pink. Picotee. Grenadine. Figs. 366–8, 370–5. Plate IV. Cespitose, glabrous, 1–3 ft., the stems hard or almost woody below, the nodes or joints conspicuous: lvs. long-linear, very glaucous: fls. on long stems, particularly in American cult.; calyx-bracts very broad, abruptly pointed: Vars. solitary, large, very variable in size, form and color, but originally pale lilac, fragrant. B.M. 39 (Bizarre Carnation); 1622 (var. imbricatus); 2744 (Picotees).—Generally supposed to be native to the Mediterranean region, but Williams gives its geographical limits as "north and west Normandy" and "south and east Punjab" (northwestern Hindoostan). Long cultivated. In Europe it is largely grown as an outdoor Pink, but in this country it is chiefly known as the greenhouse Carnation. The American forcing type is distinguished by very long stems and a continuous blooming habit. Garden varieties of *D. Caryophyllus* are numberless, and they often pass under Latinized names (*D. punctàtus*, Hort., is one of these names). For studies in the history and evolution of the Carnation, see Bailey, Survival of the Unlike, Essay 28. See *Carnation.*



702. Dianthus Chinensis (× ⅓).

9. **sylvéstris**, Wulf (*D. virgíneus*, Hort.). Slender, 1 ft. high, the stem angular compressed and bearing 1–3 odorless fls.: lvs. tufted, linear and sharp-pointed, scabrous on the margins: fls. rather small, red, the petals obovate and shallow-toothed. Eu. B.M. 1740.—Pretty perennial border plant.

BB. *Calyx-bracts half the length of the calyx, mostly narrow-pointed: lvs. short and spreading, the radical ones obtuse or nearly so.*

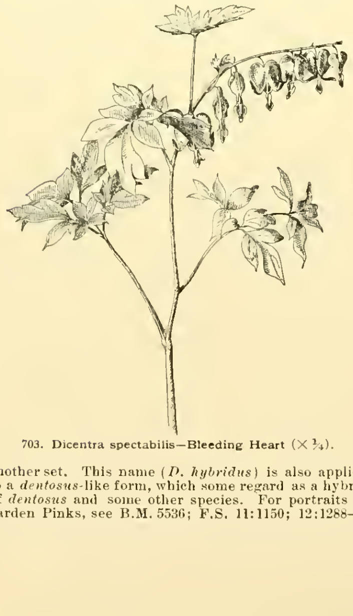
10. **deltoides**, Linn. Maiden Pink. Tufted, 6–10 in., blooming in spring and early summer, creeping: stems ascending, forking, with solitary fls. on the branchlets: stem lvs. an inch long, sharp-pointed: fls. small (½–¾ in. across), the petals toothed, deep red with a crimson eye, the petals bearing an inverted V-shaped pocket at their base (whence the name *deltoides*). Scotland to Norway and Japan.—One of the prettiest border Pinks, making neat mats of foliage and bearing profusely of the little bright fls. There is a white-fld. variety.

11. **alpìnus**, Linn. Very dwarf, the 1-fld. stems rarely reaching more than 3–4 in. high, more or less prostrate: foliage dark shining green: fl. 1 in. or more across, deep rose or purplish and crimson spotted, a darker ring around the eye. Russia to Greece and Swiss Alps. B.M. 1205. Gn. 26:455; 47, p. 292; 45, p. 53.—One of the choicest of alpine and rockwork plants.

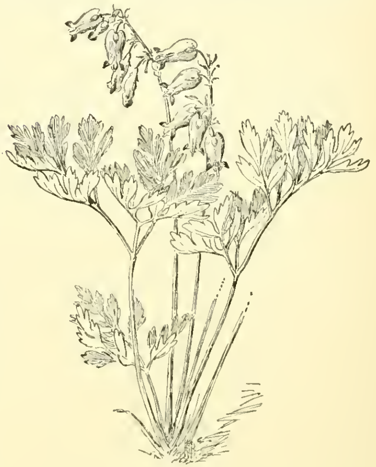
BBB. *Calyx-bracts leafy and spreading.*

12. **glaciàlis**, Hænke. Three to 4 in. high, the stems tufted and usually 1-fld.: lvs. green, narrow-linear and pointed, somewhat serrulate: fls. small and odorless, red-purple; the petals toothed. Mts. of S. Eu. G.C. II. 21:809.—A pretty species, but difficult to establish. Grown among alpine plants.

13. **Chinénsis**, Linn. (*D. Sinénsis*, Hort.). Fig. 702. Perennial, cespitose, glabrous, more or less creeping at base: stem forking, angled and more or less grooved, pubescent: lvs. broad and nearly flat or slightly trough-shaped, 3–5-nerved: fls. large, solitary or more or less clustered, pink or lilac; the petals (at least in the wild) barbed or hairy towards the base; calyx-bracts 4, in some cult. vars. short.—China and Japan; but recent authorities consider a European Pink to be but a form of it, and thereby extend its range west to Portugal. The Amoor Pink (*D. dentòsus*, Fisch.) is a form known as var. **macrosépalus**, Franch.: it is a hardy border plant, 1 ft. high, with bright red fls. and a spot at base of each petal. *D. semperflòrens*, Hort., is a hardy perennial form, 12–18 in., with silvery foliage and deep pink, red-eyed, fragrant fls. *D. Chinensis* has given rise to a beautiful and variable race of garden Pinks, var. **Héddewigi**, Regel (*D. Héddewigi*, Hort.). These are extensively grown from seeds, and are practically annuals, although plants may survive the winter and give a feeble bloom in the spring in mild climates. The flowers are scarcely odorous. They are single and double, of many vivid colors; and many of the garden forms have bizarre markings. In some forms, var. **laciniàtus**, Regel (*D. laciniàtus*, Hort.), the petals are slashed and cut. **D. imperiàlis**, Hort., is a name applied to a strain with strong habit and rather tall growth, mostly double. **C. diademàtus**, Hort., is another garden strain. **D. Cincinnàtus**, Lem., is a red form with shredded petals. I.H. 11:388. **D. hỳbridus**, Hort., is another set. This name (*D. hybridus*) is also applied to a *dentosus*-like form, which some regard as a hybrid of *dentosus* and some other species. For portraits of garden Pinks, see B.M. 5536; F.S. 11:1150; 12:1288–9; 13:1380–1. Gn. 49:1051. The garden Pinks are of easy culture. Seeds may be sown in the open where the plants are to stand, but better results are obtained, at least in the north, if plants are started in the house. Plants bloom after the first fall frosts. They grow 10–16 in. high, and should be planted 6–8 in. apart. They are very valuable for borders and flower gardens.



703. Dicentra spectabilis—Bleeding Heart (× ¼).



704. Dicentra formosa (× ⅓).

14. **latifòlius**, Hort. Perennial, 6–12 in. high, of doubtful origin, but in habit intermediate between *D. Chinensis* and *D. barbatus*. Fls. large, double, in close clusters or even heads: lvs. oblong-lanceolate.—A good border plant.

D. viscordàlis is a name which once was advertised by Manning, but is not now in the trade. The seed was obtained from an English firm. It is probably a garden form of some old species.
L. H. B.

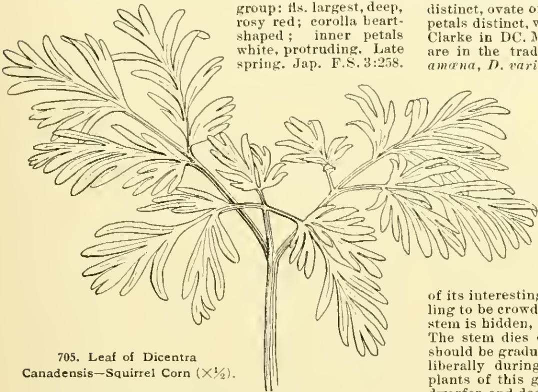
DICÉNTRA (Greek, *dis, kentron*, two-spurred, but originally misprinted *Dielýtra*, and then supposed to be *Dielytra*). *Fumariàceæ*. A genus of charming hardy perennial plants with much cut foliage, and rose, white or yellow fls. of interesting structure. The Squirrel Corn and Dutchman's Breeches are two of our daintiest native springtime flowers, and the Bleeding Heart is one of the choicest memories of old-fashioned gardens: it is also the most widely cultivated of all the plants of this delightful order. Though long known to herbaria, plants of Bleeding Heart were not introduced to western cultivation from Japan until the late forties. Robert Fortune saw it on the Island of Chusan, where he also got *Diervilla rosea* and the epoch-making "Chusan Daisy," the parent of pompon Chrysanthemums. The first live plants seen in England flowered in May, 1847. It rapidly spread into every garden in the land, and is now rich in home associations. It is an altogether lovely plant. There are about 15 species of Dicentra, mostly N. American. Sepals 2, scale-like: petals united into a 2-spurred or heart-shaped nectariferous corolla: stamens diadelphous.

Dicentras are easily cultivated in borders and wild gardens. Two kinds can be readily secured from the woods in the E. Try to reproduce the natural conditions, especially the degree of shade. They like a rich, light soil. Prop. by dividing crowns or roots. It is a singular fact that the forcing of Bleeding Hearts, though practically unknown in America, is said to be commoner in England than outdoor culture. According to Nicholson, the forcing must be very gentle and the plants kept as near the glass as possible. It is best to have fresh plants each year, and return the forced ones to the border.

A. *Fls. rose-purple.*

B. *Racemes simple.*

spectábilis, Hem. (*Diélytra spectábilis*, G. Don). BLEEDING HEART. Fig. 703. Height 1–2 ft.: lvs. and lfts. broadest of the group: fls. largest, deep, rosy red; corolla heart-shaped; inner petals white, protruding. Late spring. Jap. F.S. 3:258. B.M. 4458. R.H. 1847:461. Gn. 40:820.—The white-fld. variety has a weak growth and sickly appearance.



705. Leaf of Dicentra Canadensis—Squirrel Corn (×½).

BB. *Racemes compound.*

C. *Inner petals protruded.*

exímia, Torr. Fls. deep rose, heart-shaped, tapering to a neck, which is longer and narrower than in *D. formosa*, the tips of the outer petals much longer. Rocks of western N. Y. and Mts. of Va. Var. **multipinnàta**, Hort., has lvs. still more finely cut. "The handsomest foliaged hardy plant in our entire collection."—*J. W. Manning.*

CC. *Inner petals scarcely protruded.*

formòsa, Walp. Fig. 704. Fls. pale rose, with a short, thick neck, the tips of the outer petals shorter than in *D. eximia*. According to Gray, Syn. Flora, the fls. are cordate, but B.M. shows 2 pronounced spurs, with tips pointing toward each other. Mn. 8:17. B.M. 1335 (as *Fumaria formosa*). Calif. north.

AA. *Flowers yellow.*

chrysántha, Walp. Pale and glaucous: inflorescence thyrsoid-paniculate: fls. numerous, as many as 50 in a thyrse, erect, golden yellow; corolla deciduous; outer petals hardly larger than the inner, the tips soon recurving to below the middle. Dry hills, Calif. F.S. 8:820 (as *Capnórchis chrysántha*).—Rare in cult.

AAA. *Flowers chiefly white.*

B. *Corolla merely heart-shaped, the spurs being short and rounded.*

Canadénsis, Walp. (*Diélytra Canadénsis*, G. Don). SQUIRREL CORN, from the scattered tubers resembling grains of maize. Fig. 705. Lvs. finely cut: raceme simple, few-fld.: fls. white, tipped with rose; crest of the inner petals conspicuous, projecting. Nova Scotia to Mich., south to Penn. and Ky., but chiefly northward in the vegetable mold of rich woods. B.M. 3031.

BB. *Corolla not heart-shaped, the spurs longer and divergent.*

Cucullària, Bern. (*Diélytra Cucullària*, G. Don). DUTCHMAN'S BREECHES. Fig. 706. Easily told from *D. Canadensis* by its loose, granular cluster of tubers: lvs. finely cut: racemes simple, few-fld.: fls. white, tipped creamy yellow; crest of the inner petals minute. Nova Scotia to L. Huron, S. C. to Mo. I.H. 6:215. Mn. 6:41. A.G. 13:516. D. 35. B.M. 1127 (as *Fumaria Cucullaria*).

W. M.

DICHORISÁNDRA (Greek words referring to the division of the stamens into two series). *Commelinàceæ.* About 28 species of tropical perennial herbs, with handsome foliage, often beautifully variegated, and rich blue fls. borne in thyrse-like panicles. Sepals distinct, ovate or oblong, green or colored, about equal; petals distinct, wider than the sepals; stamens 6. C. B. Clarke in DC. Mon. Phan. 3:272 (1881). The following are in the trade but not sufficiently described: *D. amœna*, *D. variegata*, *D. Zanoni.*

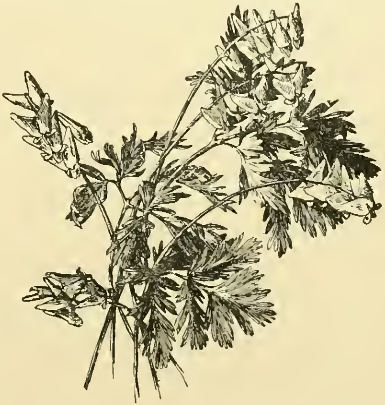
W. M.

Dichorisandra thyrsiflora is a satisfactory plant of unusual and interesting appearance, which requires little attention when once well established, and may be relied upon to flower regularly year after year. It needs careful repotting every year at first until a good-sized pot (say 8 in.) is well filled with roots. It then throws up a strong shoot each year about 6 ft. high, unbranched, and with perhaps 8 or 9 lvs. near the top. The handsome thyrse of dark blue fls. gives a color that is rare in the greenhouse. This plant may be the only representative of its interesting order in a private collection. It is willing to be crowded into the background, where its bare stem is hidden, and where the light may be poorest. The stem dies down in the winter time, when water should be gradually withdrawn. Water should be given liberally during the growing season. Of the foliage plants of this genus, *D. mosaica* is commonest. It is dwarfer, and does not flower so regularly.

Cult. by ROBERT SHORE.

A. *Foliage not variegated.*

thyrsiflòra, Mikan. Distinguished by its large lvs., which are lanceolate, narrowed into a distinct petiole, glabrous, 6–10 in. long, 2 in. wide, green on both sides: stem about 3 ft. high, scarcely branched, robust, glabrous: racemes subpanicled, pubescent: sepals glabrous, blue or somewhat herbaceous. Braz. B.R. 8:682. L.B.C. 12:1196. P.M. 3:127.



706. Dicentra Cucullaria—Dutchman's Breeches (×⅓).

AA. *Foliage variegated.*

mosàica, Linden (*D. musàica*, Koch & Lind.). Distinguished by its large, broadly elliptical lvs., which are roundish at the base, sessile, glabrous, about 6 in. long, 3–4 in. wide, with a short, sharp, rather abrupt point: stem unbranched, robust, spotted: raceme short, densely thyrsoid: sepals white or greenish. Gt. 1868:593. F.S. 16:1711.—Its chief beauty is the mosaic appearance of the foliage, due to numberless short, transverse, whitish lines, which do not pass by the longitudinal veins of the leaf. The under side of the lvs. is a rich purplish color. Var. **gigantèa**, Hort., is cult. abroad.

Var. **undàta** (*D. undàta*, C. Koch & Linden). Foliage without any mosaic appearance, the variegation being entirely longitudinal. Each parallel vein lies in the middle of a long, whitish band extending the full length of the leaf. F.S. 17:1763.—Clarke refers *D. undata* to *D. mosaica*, but horticulturally they are very distinct.

Sièbertii, Hort. A little known plant with white midrib and margins.

D. acaùlis, Cogn. Stemless: lvs. in a rosette, almost sessile, narrowly oblong, wavy, acutish, short-cuneate at the base, sparsely pilose on both sides: panicles terminal, sessile, much shorter than the lvs. Braz. I.H. 41:19. Handsomely variegated with countless short, longitudinal lines.—*D. angustifòlia*, Lind. & Rod. Stem purple, spotted green: lvs. oblong-lanceolate, sessile, glabrous, roundish at the base, acute, about 6 in. long, 2 in. wide at the middle, purple below, marked above with short, transverse, white lines. Equador. I.H. 39:158.—*D. leucophthalmos*, Hook., differs from all here described in having radical inflorescence, its fls. lying flat on the ground. Lvs. elliptic, acuminate, green on both sides: fls. blue, with a white eye; stamens 6. Braz. B.M. 4733.—*D. oxypètala*, Hook., is instantly recognized by its acute petals, which are purple. Lvs. green on both sides. Braz. B.M. 2721.—*D. pícta*, Lodd., has narrower petals than usual, with a white spot at the base, but is told from all others here described by the irregular blotches of purple on the upper side of the lvs. The purple is the same color as that on the under surface. Braz.? B.M. 4760. L.B.C. 17:1667.—*D. Saùndersi*, Hook., differs from all others here described in the extreme density of its head-like inflorescence. Lvs. green on both sides, lanceolate: sepals white, tinged blue. Braz. B.M. 6165.

W. M.

DICHRÒA (Greek, *dis*, two, and *chros*, color). Includes *Adamia*. *Saxifragàceæ*. This genus contains a rare greenhouse shrub in habit resembling a Hydrangea, with violet-blue fls. in a pyramidal panicle a foot across, and handsome blue berries, instead of the capsular fruit of Hydrangea. Lvs. persistent, alternate, stalked, widest at middle, tapering both ways, serrate: panicles terminal, many-fld.: fls. blue, lilac, or violet; petals 5 or 6, valvate; styles 3–5, club-shaped. The genus has only 2 species, the commoner and more variable one, *D. febrifuga*, which is glabrous, being found in the Himalayas, Malaya, and China, while *D. pubescens* is native to Malaya only.

febrifùga, Lour. (*Adàmia versicolor*, Hort.). Later writers also include *Adàmia cyànea*, Wall., which Lindley distinguished by its smaller lvs. and fls., 5 petals, and 10 stamens, while *A. versicolor* had 7, or sometimes 6 petals, and 20 stamens. Plants are still cultivated abroad under the name of *A. cyanea*, but it cannot be stated here how distinct they are for horticultural purposes. *A. versicolor*, P.M. 16:322. *A. cyanea*, B.M. 3046.

W. M.

DICKSÒNIA (named for James Dickson, an English botanist, 1738–1822). *Cyatheàceæ*. Tree ferns with a distinctly 2-valved inferior indusium, the outer valve formed by the apex of the leaf segment. A small genus, mostly of the southern hemisphere. For *D. pilosiuscula*, *punctilobula* and *Smithii*, see *Dennstædtia*.

Dicksonias are amongst the most important tree ferns, both for their beauty and because of their relative hardiness. In their native countries some of them are occasionally weighted with snow, and *D. antarctica* has to endure frosts. They can be grown in coolhouses, and should be tried southward outdoors in sheltered places. Their trunks are more fibrous than those of most tree ferns, and hence more retentive of moisture, so that they need less care. A good trunk produces 30–40 fronds a year, and retains them until the next set is matured, unless the trees suffer for moisture in winter. Although they rest in winter, the fronds soon shrivel up if the trunks are allowed to get too dry. Dicksonias should have their trunks thoroughly watered twice a day during the growing season. These waterings should be gradually decreased until winter, when the trunks should be kept merely moist all the time. Only in the hottest summer days is slight shade needed. It is a pity to grow tree ferns in pots, but if this must be done several principles should be observed. The lapse of a single day's watering will often cause serious damage. As a rule, the pots should be of the smallest size consistent with the size of the trunk. Three or four inches of soil all round the trunks is enough. The above points are taken from Schneider's Book of Choice Ferns, as tree ferns are little grown in America.

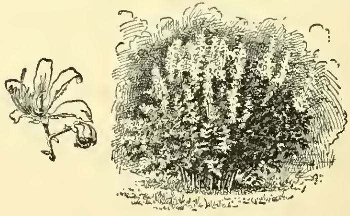
antárctica, Labill. Scales of the short leaf-stems dense, dark purplish brown: lvs. 5–6 ft. long, the central pinnæ 12–18 in. long; segments oblong, the sterile incised. Australia and Tasmania. G.C. III. 9:81.—Trunk sometimes 30–35 ft. high. A very useful decorative plant.

squarròsa, Swz. Scales of the short leaf-stem fibrillose, light colored: lvs. 3–4 ft. long, the pinnæ 9–15 in. long; segments lanceolate, the sterile toothed, the ribs scabrous. New Zealand and Chatham Island.

L. M. UNDERWOOD and W. M.

DICLYTRA. This ancient typographical error for Dielytra seems to be immortal. See *Dicentra*.

DICTÁMNUS (old Greek name, supposed to indicate foliage like the ash: hence Fraxinella, diminutive of the Latin Fraxinus, an ash). *Rutàceæ*. GAS PLANT. BURNING BUSH. FRAXINELLA. DITTANY. This genus includes an old garden favorite which has a strong smell of lemon, and will sometimes give a flash of light on sultry summer evenings when a lighted match is held near the flowers. It is also one of the most permanent and beautiful features of the hardy herbaceous border. Instances are known in which it has outlived father, son and grandson in the same spot. The genus has only 2 species, and is distinguished from allied genera (none of which have garden value) by the 5 unequal petals, 10 declined stamens, and short stipe, on which the ovary is raised.



707. The Gas Plant—Dictamnus albus.

The Gas Plant makes a sturdy, bold, upright growth, and a clump 3 feet high and as much in thickness makes a brave sight when in flower. A strong, rather heavy soil, moderately rich, is best for these plants. They are not fastidious as to situation, succeeding as well in partial shade as when fully exposed to the sun, and drought will not effect them when once fairly established. Old, strong clumps are good subjects as isolated specimens on a lawn, and a large patch, planted in the border, is not only effective while in full flower, but the dark, persistent foliage is ornamental throughout the season. It is not advisable to disturb the plants very often, as they improve with age, producing taller flower-stems and more of them as they grow older. They are excellent for cutting, especially the white variety. Prop. with difficulty by division, but easily by seeds, which are sown in the open ground in fall as soon as ripe, and covered an inch or so. They will germinate the next spring, and, when two years old, the seedlings may be removed to their permanent positions, where they will flower the following year.

álbus, Linn. (*D. Fraxinélla*, Pers.). Fig. 707. A vigorous, symmetrical, hardy herb, with glossy, leathery foliage surmounted by long, showy terminal racemes of good-sized, fragrant fls. Lvs. alternate, odd-pinnate; lfts. ovate, serrulate, dotted with oil glands: fls. white. Eu., N. Asia. Gn. 35:701. A.F. 5:328. Gng. 5:321. Var. **rùbra**, Hort., has rosy purple fls., the veins deeper colored. Var. **gigantéus**, Hort. (*D. giganteus*, Hort.), was recently introduced.
J. B. Keller and W. M.

DICTYOGRÁMMA (Greek, *netted lines*). *Polypodiàceæ*. A genus of a few Japanese and Pacific Island ferns, with naked sori, which follow the course of the reticulated veins. The species are sometimes referred to Gymnogramma. Strong-growing indoor fern, useful for specimen plants.

Japónica, Fée. Lvs. simply pinnate or bipinnate at the base, 1½–2 ft. high, the pinnæ 6–12 in. long and an inch wide; sori extending from the midrib to the edge. Japan and Formosa. Also known as *Gymnogramma Japonica*. An interesting fern of rather strong growth, and very distinct in appearance. Grows best in a moderate temperature—for example, 55–60°—and requires an open and well-drained soil of peaty character.
L. M. Underwood and W. H. Taplin.

DICTYOSPÉRMA (Greek, *netted seed*). *Palmàceæ*, tribe *Arèceæ*. This genus of Areca-like palms contains a few species of considerable commercial importance, the young plants being used chiefly for house and table decoration. Slender spineless palms, with a ringed trunk: lvs. equally pinnatisect; segments linear-lanceolate, acuminate or bifid, the apical ones confluent; margins thickened, recurved at the base; midrib and nerves prominent, sparsely clothed with persistent scales beneath, or naked; rachis and petiole slender, scaly, 3-sided, furrowed, sheath elongated, entire: spadix on a short glabrous or tomentose peduncle, the branches erect or spreading and flexuose, the lower ones with membranaceous bracts at the base: spathes 2, complete, dorsally compressed, papery, the lower one 2-crested; flower-bearing areas much depressed: bracts and bractlets scaly: pistillate fls. rather large, white or yellowish: fr. scaly, small, olive-shaped or subglobose. Species 2 or 3. Indian Archipelago.
Jared G. Smith.

Dictyosperma is a genus of medium-sized palms of slender habit, and having pinnate leaves. At least two species of Dictyosperma (*rubra* and *alba*) have been included among commercial palms for some years past, though not grown in such quantities as the popular Kentias, Arecas and Latanias. *D. aurea* is also occasionally seen in commercial collections.

The cultivation of these palms does not present any great difficulties, similar conditions to those required by *Chrysalidocarpus lutescens* answering well. These conditions may be briefly summarized as follows: A soil consisting of well rotted sod, to which has been added about one-sixth, in bulk, of good stable manure, firm potting, and an abundance of water both at the root and overhead, a night temperature during the winter of 60 to 65° F., and moderate shade on the glass from March 1 to November 1. This treatment applies especially to young stock, and may be modified somewhat with old and well established specimens, the latter enduring a slightly lower temperature without injury, providing they are not overwatered. Dictyospermas are rather susceptible to the attacks of some insects, notably red spider and various scale insects, and, if allowed to become very dry, are liable to lose their lower leaves, the most satisfactory species being *D. rubra*. Propagation by seeds, which germinate in 6 to 8 weeks, when sown in a warm greenhouse.
W. H. Taplin.

álba, Wendl. & Drude (*Arèca álba*, Bory. *Ptychospérma álba*, Scheff.). Distinguished by the whitish petioles and the whitish green veins of the lvs. Candex 40–50 ft. high, 8–9 in. in diam., dilated at the base: lvs. 8–12 ft. long; petiole 6–18 in. long, grooved down the face; segments 2½–3 ft. long, 2–3 in. wide, 7-nerved; veins and margins green or reddish: branches of the spadix 6–18 in. long, erect or slightly reflexed, zigzag when young.

aùrea, Wendl. & Drude (*Arèca aùrea*, Hort.). Distinguished by the yellow or orange petioles and veins of young plants. Caudex about 30 ft. high, smaller and more slender than the preceding: lvs. 4–8 ft. long; petiole 8 in. long; segments 1½–2 ft. long, 1 in. wide; secondary veins scarcely visible: branches of the spadix rigidly erect, 9–11 in. long.

furfuràcea, Wendl. & Drude (*Arèca furfuràcea*, Hort.). Like *D. rubra*, but the petiole and leaf-sheath of the young plant tomentose.

rùbra, Wendl. & Drude (*Arèca rùbra*, Hort.). Resembling *D. alba*, but the lvs. of the young plants darker green, the primary veins and margins dark red, the redness disappearing very much in adult plants: branches of the spadix longer and more reflexed.
Jared G. Smith.

DICÝRTA is a gesneraceous genus closely allied to Achimenes, but with smaller fls. and different anthers. It has 2 species, both from Guatemala. *D. candida* is cult. abroad as *Achimenes candida*.

DIDÍSCUS. See *Trachymene*.

DIDYMOCHLǼNA (Greek, *twin cloak;* alluding to the indusium). *Polypodiàceæ*. A small genus of greenhouse ferns of rather coarse foliage. Indusium elliptical, emarginate at the base, attached along a central vein, free all round the margin.

lunulàta, Desv. (*D. truncatàta*, Hort.). Lvs. clustered from an erect caudex, bipinnate, 3–6 ft. long; pinnules almost quadrangular ¾–1 in. broad, entire or slightly sinuate, each bearing 2–6 sori. Cuba to Brazil; the same or an allied species in Madagascar and Malaya.—*D. lunulata* is a very attractive fern while in a small state, but its articulated pinnules are a drawback as a commercial species, rendering it of little value for house decoration.
L. M. Underwood and W. H. Taplin.

The following points are condensed from Schneider's admirable work, The Book of Choice Ferns: *D. lunulata* is one of the most distinct ferns in cultivation. It looks like a tree maidenhair, but the stems, instead of being black and slender, are thick and fleshy and the leaves are fleshier than any Adiantum. In cult. the trunk is only a few inches high, but the fronds are 4–6 ft. long and densely covered with long, brown, chaffy scales. The metallic color of its young fronds is a fine feature. This is a warmhouse fern, and may be used for subtropical bedding. It has a bad trick of dropping its pinnules if allowed to get too dry at the root, but soon rallies under liberal treatment.

DIDYMOSPÉRMA (Greek, *double-seeded*). *Palmàceæ*, tribe *Arèceæ*. Low or erect palms with slender trunks. Leaves terminal, unequally pinnatisect, silvery-scaly below; segments opposite, alternate, solitary, or the lower ones in groups, cuneate at the base; obovate-oblong or oblanceolate, sinuate-lobed and erose, the terminal one cuneate; margins recurved at the base; midnerve distinct, nerves flabellate: sheath short, fibrous: spadices with a short, thick peduncle and thick branches: spathes numerous, sheathing the spadix: fls. rather large: fr. ovoid or oblong. Species 6. India and Malay Archipelago.

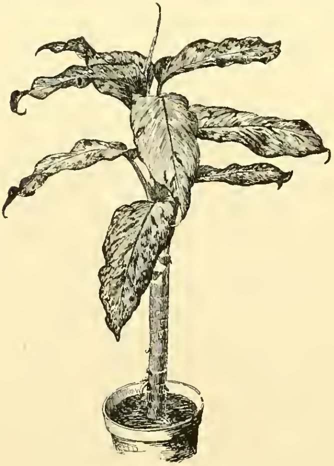
porphyrocárpon, Wendl. & Drude (*Wallichia porphyrocárpa*, Mart.). Stems reedy, 3–6 ft.: lvs. 5–8 ft. long; leaflets 9–15 in. long, distant, narrowly oblong, long cuneate, blunt, or sinuately 2–3-lobed, truncate, denticulate, glaucous beneath. Java.

Didymosperma is a genus of East Indian palms of moderate growth, containing possibly 8 species, most of which are stemless or else forming but a short trunk, the pinnate leaves rising from a mass of coarse brownish fibers that surround the base of the plant. The leaflets are of irregular shape, bearing some resemblance to those of Caryota, and the plants frequently throw up suckers from the base. The members of this genus are not very common in cultivation. The species that is most frequently seen is the plant known to the trade as *D. caryotoides*, an attractive warmhouse palm that has also appeared under the synonym *Harina caryotoides*, and has lately been referred to Wallichia, which see. While young, at least, the Didymospermas enjoy a warm house and moist atmosphere with shading from full sunshine, though we are told that one species, *D. oblongifolia* (or *Wallichia*), is frequently found in Sikkim at an elevation of 3,000 feet above the sea. Prop. usually by seeds; occasionally by suckers, which are kept rather close for a time after their removal from the parent plant.

JARED G. SMITH and W. H. TAPLIN.

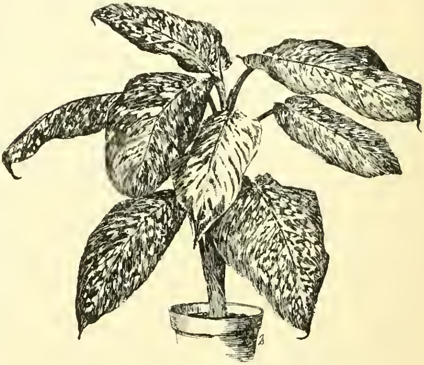
DIEFFENBÁCHIA (Dieffenbach, a German botanist). *Aroideæ*. Low, shrubby perennials: stems rather thick, inclined or creeping at the base, then erect, with a leafy top: petioles half cylindrical, sheathed to above the middle, long, cylindrical at the apex; blade oblong, with a thick midrib at the base; veins very numerous, the first and second parallel, ascending, curving upwards at their ends: peduncle shorter than the lvs. Differs from Aglaonema in floral characters. Central and South America. Perhaps a dozen species. Engler (in DC. Monogr. Phaner. vol. 2) recognizes 6 species, with many varieties. Dieffenbachias are popular hothouse plants, being grown for their handsome and striking foliage.

For Dieffenbachias, similar rooting material to that mentioned for Anthuriums, combined with a high and moist atmosphere, will produce a very healthy and luxuriant growth of foliage, especially after the plants have made their first few leaves in ordinary light potting soil. Unless it be the very large-leaved kinds, like *triumphans*, *nobilis* and *Baumanni*, three or four plants may be placed together in large pots, keeping the balls near the surface in potting. *Jenmani*, *Shuttleworthiana*, *Leopoldii* and *eburnea* are all well suited for massing together in large pots. When above a certain height, varying in different species, the plants come to have fewer leaves, and those that remain are small; they should then be topped, retaining a considerable piece of the stem, and placed in the sand bed, where they will throw out thick roots in a week or two. The remaining part of the stems should then be cut up into pieces 2 or 3 inches long, dried for a day or so, and then put into boxes of sand, where, if kept warm and only slightly moist, every piece will send out a shoot, and from the base of this shoot roots will be produced. These can be potted up as soon as roots have formed.



708. Dieffenbachia picta, var. Bausei.

picta, Schott. Blade oblong, or oblong-elliptical, or oblong-lanceolate, 2½–4 times longer than wide, rounded or acute at the base, gradually narrowing to the long acuminate-cuspidate apex, green, with numerous irregular oblong or linear spots between the veins; veins 15–20 on each side, ascending. L.B.C. 7:608.



709. Dieffenbachia Seguine, var. nobilis.

Var. **Baùsei**, Engl. (*D. Baùsei*, Regel). Fig. 708. Blade nearly or completely yellowish green, with obscurely green-spotted margins and scattered white spots. I.H. 26:338.

Var. **Shuttleworthiàna**, Engl. (*D. Shuttleworthiàna*, Bull). Blade pale green along the midrib.

Seguine, Schott. Lvs. green, with white, more or less confluent stripes and spots, oblong or ovate oblong, rounded or slightly cordate or subacute at the base, narrowed toward the apex, short cuspidate; primary veins 9–15, the lower spreading, the upper remote and ascending. Lowe 14 (as var. *maculata*). W. Indies.—Called "Dumb Plant" because those who chew it sometimes lose the power of speech for several days.

Var. **Barraquiniàna**, Engl. (*D. Barraquiniàna*, Versch. & Lem. *C. gigantèa*, Versch.). Petioles and midribs almost entirely white; blade with scattered white spots. I.H. 11:387; 13:470, 471.

Var. **nóbilis**, Engl. (*D. nóbile*, Hort.). Fig. 709. Blade elliptical, acute, dull green with dirty green spots. Brazil.

Var. **lituràta**, Engl. (*D. Lèopoldii*, Bull. *D. Wallisi*, Lind.). Blade dark green, with a rather broad, yellowish green, ragged-margined stripe along the midrib; spathe glaucous. I.H. 17:11. S.H. 1, p. 455.

Var. **irroràta**, Engl. (*D. irroràta*, Schott. *D. Baùmanni*, Hort.). Lvs. large and bright green, blotched and sprinkled with white. Brazil.

The above are the recognized type species. The following are in the Amer. trade. Probably some or all of them belong to the foregoing species:

Chélsoni, Bull. Lvs. deep, satiny green, the middle gray-feathered, and the blade also blotched yellow-green. Colombia.

Córsii, Hort. See *D. Parlatorei*.

ebúrnea, Hort. Compact: lvs. light green, freely spotted with white, the stems reddish and white-ribbed. Brazil.

illústris, Hort. See *D. late-maculata*.

imperàtor, Hort. Lvs. 16–18 in. in length, 5–6 in. wide, olive-green, fantastically blotched, marbled and spotted with pale yellow and white. Colombia.

insignis, Hort. Lvs. dark green, with irregular, angular blotches of pale yellowish green, 6 or more in. wide. Colombia.

late-maculàta, Lind. & André (*D. illústris*, Hort.). Lvs. glaucous-green, profusely white-barred and white-spotted. Brazil. I.H. 23:234.

Jénmani, Veitch. Lvs. rich, bright, glossy green, relieved by a milk-white band at every lateral nerve, and by a few white spots interspersed between the bands. Guiana.

magnífica, Lind. & Rod. Lvs. ovate-acuminate, large, dark green, blotched and spotted with white along the veins. Venezuela. I.H. 30:482. S.H. 2, p. 383.

marmòrea, Hort. See *Parlatorei*.

Parlatòrei, Lind. & André, var. **marmòrea**, André (*D. memoria* and *mormora* and *Corsii*, Hort.). Lvs. long-oblong, acuminate, the midrib white and the blades blotched white, the green deep and lustrous. Colombia. I.H. 24:291.—Engler refers this plant to the genus Philodendron.

Regina, Bull. Lvs. oblong-elliptical, greenish white, mottled and blotched with alternate light and green tints. S. Amer.

Réx, Hort. Compact: lvs. oblong-lanceolate, the two sides not equal, deep green, but the white angular blotches and midrib occupying more space than the green. S. Amer.

spléndens, Bull. Stem faintly mottled with dark and light green: lvs. have a thick ivory white midrib, and the ground color is of a deep, rich, velvety bottle green, with a resplendent, lustrous surface, freely marked with whitish striate blotches. Colombia.

triúmphans, Bull. Lvs. dark green, ovate-lanceolate and acuminate, a ft. long, irregularly marked with angular yellowish blotches. Colombia.

JARED G. SMITH and G. W. OLIVER.

DIÉLYTRA. See *Dicentra*.

DIERVÍLLA (after Dierville, a French surgeon, who took *D. Lonicera* to Europe early in the eighteenth century). *Caprifoliàceæ*. WEIGELA. Shrubs of spreading habit, with more or less arching branches, and, especially the Asiatic species, with very showy fls. from pure white to dark crimson, appearing late in spring. Lvs. opposite, petioled, serrate: fls. in 1 to several-fld. axillary cymes, often panicled at the end of the branches, yellowish white, pink or crimson, epigynous; calyx 5-parted; corolla tubular or campanulate, 5-lobed, sometimes slightly 2-lipped; stamens 5: fr. a slender, 2-celled capsule, with numerous minute seeds. About 10 species in E. Asia and N. Amer. They thrive in any common humid garden soil, the Amer. species preferring moist and partly shaded positions. The Asiatic species require protection north during the winter, or sheltered positions. Prop. readily by greenwood cuttings or hardwood cuttings; the Amer. species usually by suckers and by seeds sown in spring.

Index of species (some of the names in italics were described under Weigela): *amabilis*, 3; *arborea*, 4; *arborescens*, 6; *Canadensis*, 1; *Coraeensis*, 4; floribunda, 6; florida, 3; grandiflora, 4; *Groenewegeni*, 7; *hortensis*, 5; hybrida, 7; Japonica, 5; Lonicera, 1; Middendorfiana, 8; *multiflora*, 6; *rosea*, 3; sessilifolia, 2; *Steltzneri*, 7; *trifida*, 1; *Van Houttei*, 7.

A. *Fls. yellow, slightly 2-lipped, small. ½–¾ in. long.*

Diervilla proper.

1. **Lonicèra**, Mill. (*D. trífida*, Mœnch. *D. Canadénsis*, Willd.). Shrub, to 3 ft.: branchlets nearly terete, glabrous: lvs. distinctly petioled, ovate-oblong, acuminate, serrate, nearly glabrous, finely ciliate, 3–4 in. long: cymes usually 3-fld.; limb nearly equal to the tube. June, July. Newfoundland to Saskatschewan, south to Ky. and N. C. B.M. 1796. D. 44.

2. **sessilifòlia**, Buckl. Shrub, to 5 ft.: branchlets quadrangular: lvs. nearly sessile, ovate-lanceolate, serrate, nearly glabrous, of firmer texture, 3–6 in. long: cymes 3–7-fld., often crowded into dense, terminal panicles: limb shorter than the tube. June, July. Carol. and Tenn. G.C. III. 22:14.—Hardy in Canada.

AA. *Fls. showy, white, pink or crimson, rarely yellowish.*

B. *Anthers not connected with each other.* (*Weigela.*)

C. *Calyx lobes lanceolate, connate at the base, often to the middle: stigma 2-lobed: seeds wingless.*

3. **flòrida**, Sieb. & Zucc. (*Weigèla ròsea*, Lindl. *W. amábilis*, Hort.). Shrub, to 6 ft.: branchlets with 2 hairy stripes: lvs. short-petioled, elliptic or ovate-oblong, serrate, glabrous above except at the midrib, tomentose on the veins beneath: calyx nearly glabrous: ovary slightly hairy: fls. 1–3, pale or deep rose, 1¼ in. long; corolla broadly funnel-shaped, abruptly narrowed below the middle. May, June. N. China. B.M. 4396. F.S. 3:211. B.H. 1:577.—This is one of the most cultivated species, very free-flowering and rather hardy. Var. **álba.** Fls. white, changing to light pink. R.H. 1861:331. Var. **cándida.** Fls. pure white. Var. **Isoline.** Fls. white or slightly pink outside, with yellowish spot in throat. F.S. 14:1445. Var. **Kosteriàna variegàta.** Dwarf: lvs. bordered yellow: fls. deep rose. Var. **Sièboldi alba-marginàta.** Lvs. bordered white: fls. rose. Var. **nàna variegàta.** Dwarf. Lvs. variegated with white: fls. nearly white.

CC. *Calyx lobes linear, divided to the base: seeds winged: stigma capitate.*

D. *Plant nearly glabrous.*

4. **grandiflòra**, Sieb. & Zucc. (*D. Coraeénsis*, DC. *D. amábilis*, Carr.). Shrub, 5–10 ft.: lvs. rather large, obovate or elliptic, abruptly acuminate, crenately serrate, sparingly hairy on the veins beneath and on the petioles: fls. in 1–3-fld., peduncled cymes; corolla broadly funnel form, abruptly narrowed below the middle, changing from whitish or pale pink to carmine. May, June. Jap. S.Z. 31. F.S. 8:855.—Vigorously growing shrub, with large lvs. and fls., but less free-flowering, and the type not common in cultivation. Var. **arbòrea**, Hort. (*W. arbòrea grandiflòra*, Hort.). Fls. yellowish white, changing to pale rose; of vigorous growth.

DD. *Plant more or less pubescent: corolla finely pubescent outside.*

5. **Japónica**, DC. Shrub, to 6 ft.: lvs. oblong-obovate or elliptic, acuminate-serrate, sparingly pubescent above, tomentose beneath: fls. usually in 3-fld., short-peduncled cymes, often crowded at the end of short branchlets; corolla broadly funnel form, narrowed below the middle, whitish at first, changing to carmine; style

710. Diervilla hybrida (× ⅓).

somewhat exserted. May, June. Jap., China. G.F. 9:405.—Var. **horténsis**, Rehder (*D. horténsis*, Sieb. & Zucc.). Lvs. nearly glabrous above, densely grayish tomentose beneath: cymes usually rather long-peduncled: fls. white or carmine. S.Z. 29, 30. More tender and slower-growing than the type. Offsprings of this variety are the following: Var. **gratissima.** Fls. light pink. Var. **nívea.** Pure white fls. Var. **Looymánsi aùrea,** with yellow lvs.: of slow growth.

6. **floribúnda,** Sieb. & Zucc. (*D. multiflòra*, Lemaire). Shrub, to 8 ft.: lvs. oblong-ovate or elliptic, acuminate, serrate, sparingly pubescent above, more densely beneath: fls. 1–3, usually sessile, mostly crowded at the end of short branchlets; corolla rather gradually narrowing toward the base, brownish crimson in the bud, changing to dark or bright crimson; lobes about 5 times shorter than the tube; style exserted. May, June. Jap. S.Z. 32. I.H. 10:383.—Vigorously growing shrub, with rather small but abundant fls. Var. **grandiflòra,** Hort. (*W. arboréscens*, Hort.). Fls. rather large, brownish crimson. Var. **Lavállei,** Hort. Fls. bright, deep crimson, smaller. Var. **Lówei,** Hort. Fls. dull, purplish crimson, small. Var. **versicólor,** Rehder (*D. versícolor*, Sieb. & Zucc.). Fls. greenish white at first, changing to crimson. S.Z. 33.

7. **hybrida,** Hort. (Fig. 710), may be used as a collective name for the different hybrids between *D. florida, floribunda, Japonica* and *grandiflora*, which are now more commonly cultivated than the typical species. Some of the best and most distinct are the following: *A. Carrière*, rose-carmine, changing to red, with yellow spot in throat; *Congo*, of vigorous growth, with abundant large, purplish crimson fls.; *Conquete*, very large, deep pink fls.—the largest fls. of all varieties; *Desboisi*, fls. deep rose, abundant; *E. André*, fls. very dark, brownish purple; *Eva Rathke*, fls. deep carmine-red, erect, very free-flowering, R.B. 19:126; *Groenewegeni*, fls. red outside, whitish within, somewhat striped with yellowish red; *Gustav Mallet*, fls. light pink, bordered white; *Mad. Coutourier*, yellowish white, changing to pink; *Mad. Lemoine*, white, with delicate blush, changing to pink; *Mad. Tellier*, large white fls., with delicate blush; *Othello*, fls. carmine, brownish outside; *P. Duchartre*. fls. deep amaranth, very dark, free; *Pécheur fils*, fls. violet-red, abundant; *Van Houttei*, fls. carmine, F.S. 14:1447; *Steltzneri*, fls. dark red,abundant.

BB. *Anthers connected with each other. (Calyptrostigma.)*

8. **Middendorffiàna,** Carr. Shrub, to 3 ft.: lvs. short-petioled, ovate-oblong or oblong-lanceolate, serrate, glabrous at length: fls. in 2–3-fld. axillary and terminal clusters; corolla campanulate, funnel form, yellowish white, spotted orange or purplish inside; calyx-teeth partially connate. May, June. E. Siber., N. China, Jap. Gt. 6:183. R.H. 1854:261. F.S. 11:1137. I.H. 4:115. G.C. III. 7:581.

D. arbòrea, Hort. = D. floribunda.—*D. pauciflòra*, Carr. D. florida.—*D. præcox*, Lemoine. Allied to D. florida. Fls. large, pink, with yellow in throat; early and free-flowering. Jap. Gt. 46:1441.—*D. rivulàris*, Gattinger. Allied to D. sessilifolia. Lvs. and branchlets pubescent: fls. in large, terminal panicles. Georgia.

ALFRED REHDER.

DIÈTES. See *Moræa.*

DIGITÀLIS (Latin, *digitus*, a finger; referring to the shape of the flowers). *Scrophulariàceæ.* FOXGLOVE. A fine genus, numbering several species and some hybrids of hardy or half-hardy herbaceous plants, famous for their long racemes of inflated flowers, which suggest spires or towers of bells. They are old-fashioned and dignified, clean of growth and wholesome company in the choicest garden. The strong, vertical lines of their flower-stalks, rising from rich and luxuriant masses of cauline leaves, give always an appearance of strength to the rambling outlines of the usual herbaceous border. The genus is a very distinct one, its nearest ally being Isoplexis, which contains a few greenhouse plants rarely cultivated. About 18 species, natives of Europe and middle and western Asia. The flowers are companulate or ventricose, 4–5-lobed; calyx 5-parted: seed pod ovate, 2-valved; seeds numerous. For a week or two the Foxgloves usually dominate the whole border. The commonest species in cultivation is *D. purpurea*, which is one of the commonest English wild flowers. The name "Foxglove" is so inappropriate that much ingenious speculation has been aroused, but its origin is lost in antiquity. The word "fox" is often said to be a corruption of "folk," meaning the "little folk" or fairies. Unfortunately, etymologists discredit this pretty suggestion. In the drug stores, several preparations of *D. purpurea* are sold. They are diuretic, sedative, narcotic. For medicinal purposes, the leaves of the second year's growth are used.

Foxgloves are of the easiest culture. The common species and hybrids can be grown as biennials from seed. The perennial species are propagated by seeds or by division. J. B. Keller says: "A light, well enriched soil, not too dry, suits them admirably. They succeed in partial shade or in open places."

A. *Middle lobe of the lower lip longer than the others.*

B. *Fls. rusty red.*

ferruginea, Linn. (*D. aùrea*, Lindl.). Biennial, 4–6 ft. high: stems densely leafy: lvs. glabrous or ciliate: racemes long, dense: fls. rusty yellow, reticulate-marked, downy outside; lower lip of corolla ovate, entire, bearded. July. S. Eu. B.M. 1828.

BB. *Fls. gray or creamy yellow.*

lanàta, Ehrh. Perennial, 2–3 ft. high: lvs. oblong, ciliate: fls. rather small, 1–1½ in. long, grayish or creamy yellow, sometimes whitish or purplish, downy, in a dense, many-fld. raceme, with bracts shorter than the fls. July, Aug. Danube river and Greece. B.M. 1159 (poor figure).—A fine species.

711. Digitalis purpurea, var. gloxiniæflora.

Sibirica, Lindl. Has the habit of *D. ambigua*, with fls. like those of *D. lanata*. Lvs. downy, ovate-lanceolate: fls. ventricose, villose; calyx segments linear, villose. Siberia.—This is a rare trade name, and it is doubtful if this little known plant is really in cultivation.

BBB. *Fls. purplish.*

Thápsi, Linn. Plant much like *D. purpurea*. Perennial, 2–4 ft. high: lvs. oblong, rugose, decurrent: fls. purple, throat paler, marked with red dots. June–Sept. Spain.

AA. *Middle lobe of the lower lip shorter or hardly longer than the others.*

B. *Fls. yellowish.*

ambigua, Murr. (*D. grandiflòra*, Lam. *D. ochroleùca*, Jacq.). Perennial, 2–3 ft. high: lvs. ovate-lanceolate, toothed, sessile, downy below: fls. large, 2 in. long, yellowish, marked with brown; lower bracts about as long as the fls. Eu., W. Asia. B.R. 1:64.

BB. *Fls. white to purple, seldom yellowish.*

purpùrea, Linn. (*D. tomentòsa*, Link. & Hoffmgg.). COMMON FOXGLOVE. The species most commonly cultivated. Mostly biennial, but sometimes perennial. Height 2–3 ft.: lvs. rugose, somewhat downy: fls. large, 2 in. long, ranging from purple to white and more or less spotted, rather obscurely lobed. Gn. 34:676. Var. **gloxiniæflòra**, Hort. (*D. gloxinioìdes*, Carr. *D. gloxiniæflòra*, Hort.). Figs. 711, 712. Of more robust habit, longer racemes, larger fls., which open wider, nearly always strongly spotted, though a subvariety, *gloxiniæflòra álba*, is offered. *D. alba* and *punctata* of the seed trade are presumably white and spotted varieties. *D. alba*, Schrank = *D. purpurea*.

D. laciniàta, Lindl. Perennial, 2 ft. high: lvs. lanceolate, jagged: fls. yellow, downy, with ovate, bearded segments; bracts much shorter than the pedicels. Spain. B.R. 14:1201.—*D. lævigàta*, Waldst. & Kit. Perennial, 2–3 ft. high: lvs. linear-lanceolate, radical ones obovate-lanceolate: fls. scattered, glabrous, yellow. Danube and Greece.—*D. Mariàna*, Boiss. Lvs. radical, very downy, ovate-oblong: fls. rose; corolla bearded. Spain.—*D. monstròsa*, Hort. An interesting abnormal form of D. purpurea. P.G. 4:151. Monstrosities are common in this genus.—*D. purpuráscens*, Roth. Biennial: fls. yellow or sometimes purplish, pale inside, spotted at the mouth; lower lobe of corolla short. Eu.

F. A. WAUGH.

DILIVÀRIA. See *Acanthus*.

DILL (*Anèthum gravèolens*, Linn.), an annual or biennial plant of the *Umbelliferæ*. Native of S. Eu., the seeds of which are used as a seasoning, as seeds of Caraway and Coriander are. It is of the easiest culture from seeds. It should have a warm position. The plant grows 2–3 ft. high: the lvs. are cut into thread-like divisions: the stem is very smooth: the fls. are small and yellowish, the little petals falling early. It is a hardy plant. The foliage is sometimes used in flavoring, and medicinal preparations are made from the plant. The seeds are very flat and bitter-flavored.

DILLÈNIA (named by Linnæus for J. J. Dillenius, botanist and professor at Oxford). *Dilleniàceæ*. A genus of handsome East Indian trees, thought by some to be as showy as a magnolia. One species is cult. in S. Fla. and S. Calif., but it takes too much room and flowers too rarely for northern conservatories. It has gorgeous white fls. fully 9 in. across. Tall tropical trees from Asia, Indian Archipelago and Australia. Lvs. large, with pronounced pinnate, parallel venation: fls. white or yellow, lateral, solitary or clustered. *D. Indica* is said to be the showiest of the whole order, being attractive in foliage, flower and fruit. Dillenias may be grown in light, sandy loam. Prop. readily by seeds, but with difficulty from cuttings.

Índica, Linn. (*D. speciòsa*, Thunb.). Trunk stout, not high: branches numerous, spreading, then ascending: lvs. confined to the ends of branches, on short, broad, channelled sheathing petioles, the blade 6–12 in. long, oblong or oblong-lanceolate, acuminate, narrowed at the base, strongly serrate: sepals 5, thick, fleshy, enlarging and inclosing the fr.; petals obovate, white; stamens very numerous, forming a large yellow globe crowned by the white, slender, spreading rays of the stigma: fr. edible, acid, the size of an apple, many celled and many ovuled. Trop. Asia. B.M. 5016 (B.M. 449 = *Hibbertia volubilis*).

W. M.

DIMORPHÁNTHUS. Included in *Aralia*.

712. Border of Foxgloves.

DIMORPHOTHÈCA (Greek, *two-formed receptacle;* the disk florets of two kinds). *Compósitæ*. A charming genus of plants from the Cape of Good Hope which is almost totally neglected here, largely because the climatic conditions of that wonderful region are not generally understood. This genus contains about 20 species, some of which rival the Paris Daisy and others vie with Cinerarias. Annual or perennial herbs, or even somewhat shrubby: lvs alternate or radical, entire, toothed, or incised, often narrow: heads long-peduncled: rays yellow, orange, purple or white: disk fls. same colors except white. The genus is closely allied to Calendula, but has straight instead of incurved seeds. The fls. are usually said to close up, like those of Gazania, unless they have sunlight. Their backs have as great a variety of coloring as their faces. The fls. are often 3 in. across, and their long, slender rays (20 or more) give a distinct and charming effect. A dozen kinds are grown abroad, representing a wide range of colors and foliage. They are wintered in coolhouses and flowered in spring, or else transplanted to the open, where they flower freely during summer. The shrubby kind, *D. Ecklonis*, has been grown at Kew as a summer bedding plant, flowering from July to frost, and was a surprising success as a coolhouse plant, making a much branched plant 3 ft. high, and flowering freely all spring. Monograph by Harvey and Sonder, Flora Capensis 3:417 (1864–65). Sometimes called Cape Marigolds.

ánnua, Less. (*Caléndula pluviàlis*, Linn.). This is the only white-fld. annual kind and the only species sold in America at present. Erect or diffuse, simple or branched, rough with jointed and gland-tipped hairs (seen with a small lens): lvs. narrowly oblong or obovate-oblong, tapering to the base, with a few distant teeth, pilose, the uppermost smaller and narrower: peduncles terminal, nodding in fr.: fls. white above, purple or discolored beneath. Var. **ligulòsa**, Voss (*Caléndula Póngei*, Hort.), is a double form—the heads full of rays—with heads white on upper side and yellow or violet beneath.

Seven species have been pictured under various names in the Botanical Magazine—all perennials, and worth importation.

D. aurantìaca, DC. Lvs. slender, entire: fls. yellow. B.M 408.—*D. Bárberiæ*, Haw. Perennial: fls. purple above, paler beneath; disk all purple, with corollas of 2 forms. B.M. 5337.—*D. chrysanthemifòlia*, DC. Lvs. cut like a Chrysanthemum: fls. yellow, reverse reddish. B.M. 2218.—*D. cuneàta*, DC. Lvs. strongly cut: fls. scarlet-orange. B.M. 1343.—*D. Ecklonis*, DC. Differs from all in its shrubby stem and branches, and is perhaps the most promising of all. Fls. white, violet-blue, and strongly veined on the back; the disk azure-blue. B.M. 7535.—*D. nudicaùlis*, var. *grammifòlia*, Harv. & Sond. Fls. white, with a purple ring at the base, and orange-brown on the back, the disk purple. B.M. 5252.—*D. Trágus*, DC. Lvs. narrower than in D. Ecklonis, linear: fls. white, veined purple, the rays narrower at the base, reverse orange purplish, the disk purplish. B.M. 1981. W. M.

DIOCLÈA (after Diocles Carytius, said to be second only to Hippocrates among the ancients for his knowledge of plants). *Leguminòsæ*. About 16 species of tender shrubby twiners, mostly tropical American, with delicate trifoliolate leaves and blue, violet, scarlet or white fls., sometimes nearly an inch long, and borne in clusters which have been roughly compared to Wistaria. Calyx bell-shaped, 4-cut, 2 lobes shorter and narrower, standard wider than long; ovary nearly sessile; pod wide, the upper suture thickened or 2-winged. The following species is cult. in S. Calif., where it has a moderate growth, shining foliage, and clusters of 10 or more large fls. of a splendid scarlet.

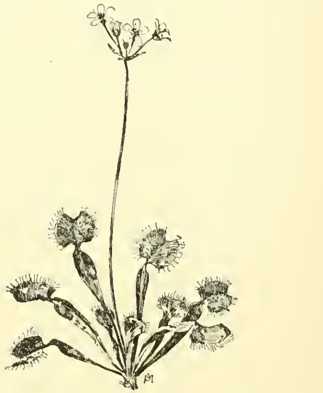
glycinoides, DC., from Rio de la Plata basin, is probably the only species grown in European gardens and in California. Fls. 1 in. long, bright scarlet, in racemes, somewhat like Wistaria: will stand some cold. Propagated by seeds, cuttings, or suckers, freely produced on grown up plants. (Syn. *Camptosema rubicundum*, Hook. & Arn.) F. Franceschi and W. M.

DION. See *Dioon*.

DIONÆA (an unusual name for Venus). *Droseràceæ*. Venus' Fly-trap. This insectivorous plant is one of the wonders of the vegetable kingdom. See Fig. 713. It closes its trap with remarkable quickness. The plant grows wild only in the sandy savannas of North Carolina. It is a perennial herb, the lvs. all radical and in a rosette, the spatulate portion being regarded as petiole, and the trap as the blade: fls. good sized, white, in a bracted corymb, borne on a leafless scape. It is allied to the sundews, other famous insectivorous plants which are also cultivated, but has about 15 stamens, a columnar style, and seeds at the base of the pod. Many famous naturalists have studied and written about this plant, and it has a large special literature. At times it is sold widely throughout the north, often at high prices, but the plants are soon "worked to death." It is difficult to keep it more than a year in the north, but it ought to be furnished in large quantities at low rates, so that all the school children may see it. It is mostly grown in conservatories associated with botanical institutions.

"It is seldom that this wonderful little plant is seen in a good state of cultivation any length of time after removal from its native haunts. Its cultivation in a greenhouse is usually attended with more or less difficulty, owing to unsuitable conditions, such as too much dry air, shade or unfriendly soil. It delights in full sunshine, with a very humid atmosphere. When the plants can be secured and transplanted with considerable of the soil in which they grow attached to the bulb-like root-stalks, they are quite easily dealt with, and may be kept in a healthy growing state for years. I find a round hanging earthenware receptacle most useful to grow them in; the bottom is carefully drained, first with large pieces of broken pots, then smaller pieces, and the upper layer is quite fine. Some chopped fibrous peat is placed above this, when the plants are built in, with live sphagnum moss used to fill the spaces between the clumps. Arranged in this way, it is hardly possible to give them too much water, and they revel in abundant supplies. If kept in the sun the leaves take on a reddish tinge, but when grown in the shade they are always green. Flowers will develop about the middle of June, but they should be nipped off as they make their appearance, for they are apt to weaken the plant.

"The Dionæa has been grown successfully in a dwelling house by a very different method. The plants were in a wide, shallow dish, without any drainage, and simply placed, not too firmly, in loose live sphagnum moss, with a glass covering. Water was given every other day by filling the space above the plants until the dish was filled, and then it was poured off. In this way the potting material never became sour. From the luxuriant condition in which these plants remained for years, I am inclined to think this was a close imitation of the conditions under which they thrive in a wild state. Some years ago, owing to Professor Asa Gray's endeavor to have the Government purchase a strip of land on which this plant grows, there existed a widespread idea that it was gradually becoming extinct. There seems to be little likelihood of this calamity, however, as Dionæa is found abundantly in some places all the way from Wilmington to Fayetteville, in North Carolina. Its permanency is all the more assured seeing that the plants thrive on soil which is of little use for agricultural purposes."—*G. W. Oliver, in Garden and Forest, 10:237 (1897)*.



713. The Venus' Fly-trap—Dionæa muscipula (×¼).

muscípula, Ellis. Fig. 713. Described above. B.M. 785. F.S. 3:280. Mn. 1:69.—The genus has only one species. W. M.

DIÒON (Greek, *two* and *egg;* each scale covers two ovules and the seeds are in pairs). *Cycadàceæ*. Handsome foliage plants suitable for warm or temperate palm houses. This once powerful order is now nearly extinct, and the few remaining species are of the greatest scientific interest and also decorative value. *D. edule* has a flat, rigid frond which is more easily kept free from scale insects than *Cycas revoluta*, the commonest species of the order in cultivation. A specimen at Kew had a trunk 3–4 ft. high and 8–10 in. thick, the crown spreading 8–10 ft. and containing 50 fronds, each 4–5 ft. long and 6–9 in. wide. Both sexes make cones frequently, the male cone being 9–12 in. long and the female 7–12 in. The seeds, which are about the size of Spanish chestnuts, are eaten by the Mexicans. Many Cycads yield arrowroot. This genus is said to be the closest to the fossil forms of any living representative of the order. The genus has the cones and twin seeds of Zamia and Encephalartus, with the flat, woolly scales of Cycas, but without the marginal seeds and loose inflorescence of the latter. Prop. by seeds. Culture same as Cycas.

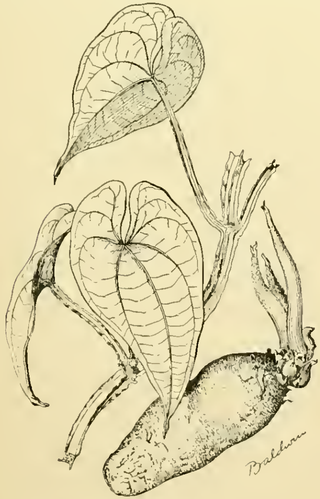
édule, Lindl. Lvs. pilose when young, finally glabrous, 3–5 ft. long, pinnatifid, rigid, narrowly lanceolate segments, about 100 on each side, linear-lanceolate, sharp-pointed, widest at the base, rachis flat above, convex beneath: male cones cylindrical, female cones ovoid. Mex. B. M. 6184. Gn. 55, p. 365. Gt. 48, p. 157. Var.

lanuginòsum, Hort., is a very woolly kind. Gt. 48, pp. 154, 155.—A variable species. *D. tomentòsum*, once sold by Pitcher and Manda, was probably woollier than the type. *D. spinulòsum*, Dyer, differs mainly in having the segments margined with small sharp points. Mex. A.F. 7:461.
W. M.

DIOSCORÈA (Dióscorides, the Greek naturalist). *Dioscoreàceæ*. The type genus of a small family (of about 8 genera) allied to Liliaceæ. It contains upwards of 150 widely dispersed and confused species, most of them native to tropical regions. Stems herbaceous and twining or long-procumbent, usually from a large tuberous root, and sometimes bearing tubers in the axils. Lvs. broad, ribbed and netted-veined, petiolate, alternate or opposite, sometimes compound. Diœcious. Fls. small; calyx 6-parted, anthers 6; styles 3, ovary 3-loculed and calyx adherent to it. Fr. a 3-winged capsule. Seeds winged. The great subterranean tubers of some species are eaten in the manner of potatoes. For an inquiry into the prehistoric cultivation of Dioscoreas in America, see Gray & Trumbull, Amer. Journ. Sci. 25:250.

A. *Stems strongly winged.*

alàta, Linn. Fig. 714. Stem 4-winged or angular: lvs. opposite, cordate-oblong or cordate-ovate, with a deep, basal sinus, glabrous, devoid of pellucid dots, 7-nerved (sometimes 9-nerved), with the outer pair united: staminate spikes compound, special ones whorled, short, flexuose: pistillate spikes simple: fls. distant, anthers subglobose, about as long as the filament: capsule leathery, elliptical. India and the S. Sea Islands.—Widely cult. in the tropics under many vernacular names. Tubers reach a length of 6–8 ft., and sometimes weigh 100 lbs.; edible. The roots continue to grow for years. Variable.

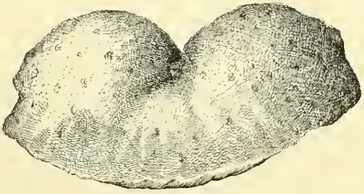


714. Dioscorea alata.
Showing foliage (× ½) and a small tuber.

AA. *Stems terete (cylindrical).*

B. *Lvs. plain green.*

divaricàta, Blanco. (*D. Batátas*, Decne.). YAM. CHINESE YAM. CHINESE POTATO. CINNAMON VINE. Very tall climbing (10–30 ft.), the lvs. 7–9 ribbed, cordate-ovate and shining, short-petioled, bearing small clusters of cinnamon-scented white fls. in the axils: root tubers deep in the ground, 2–3 ft. long, usually larger at the lower end. Philippines. F.S. 10:971. R.H. 1854, p. 247, 451–2.—This is often grown in the tropics for its edible tubers, which, however, are difficult to dig. In this country the word Yam is commonly applied to a tribe of sweet potatoes (see *Sweet Potato*). The Yam is hardy. The root will remain in the ground over winter in New York, and send up handsome tall, twining shoots in the spring. The plant bears little tubers in the leaf-axils, and these are usually planted to produce the Cinnamon Vine; but it is not until the second year that plants grown from these tubercles produce the large or full grown Yams. A form with short and potato-like tubers is *D. Decaisneàna*, Carr. (R.H. 1865:110).



715. Air Potato—Ærial tuber of Dioscorea bulbifera (× ¼).

bulbífera, Linn. AIR POTATO. Fig. 715. Tall-climbing: lvs. alternate, cordate-ovate and cuspidate, 7–9-nerved, the stalks longer than the blade: fls. in long, lax, drooping, axillary racemes. Tropical Asia. G.C. II. 18:49.—Somewhat cult. S. as an oddity and for the very large angular axillary tubers (which vary greatly in size and shape.) These tubers sometimes weigh several pounds. They are palatable and potato-like in flavor. The root tubers are usually small or even none.

villòsa, Linn. Stems slender, from knotted rootstocks: lvs. cordate-ovate, cuspidate-attenuate, 9–11-ribbed, somewhat pubescent or downy beneath, alternate, opposite or whorled: fls. greenish, the staminate in drooping panicles, the pistillate in drooping, simple racemes: capsules very strongly winged.—Common in thickets from N. Eng. to Fla. Perennial. Twining 8–10 or even 15 ft. Offered in the trade as a hardy border and arbor plant.

BB. *Lvs. variously marked and colored, at least beneath.*

discolor, Hort. Lvs. large, cordate-ovate, cuspidate, with several shades of green, white-banded along the midrib and purplish beneath: fls. greenish and inconspicuous: root tuberous. S. Amer. Lowe 54.—Useful for the conservatory. Suggestive of *Cissus discolor*.

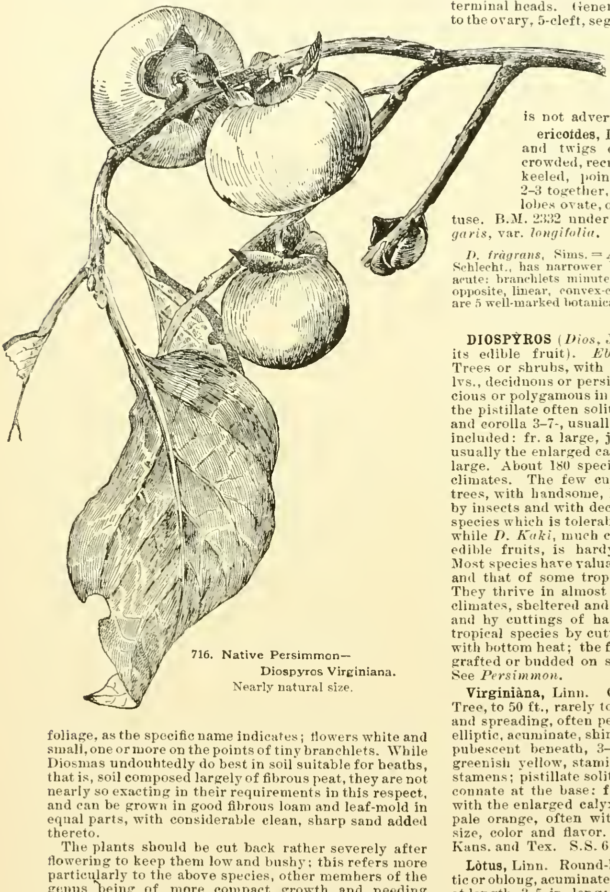
multícolor, Lind. & André. Probably only a form of the last: lvs. variously marked and blotched and veined with silvery white, red, green and salmon. S. Amer. I.H. 18:53.—Very decorative glasshouse plant.

Other species are cult. in the Gulf region. One, with 2-winged stem and 3-lobed lvs. (the "Yampie"), is perhaps *D. tríloba*, Linn. One with prickly cylindrical stems and opposite oblong-ovate lvs. may be *D. nummulària*, Lam.

D. satìva, Linn., was founded upon a number of tropical cultivated species, and the name should be dropped.—For Japanese cultivated species, see Georgeson, A.G. 13:80, with illustrations.
L. H. B.

DIÓSMA (Greek, *divine odor*). *Rutàceæ*. Small, tender, heath-like shrubs from southwestern Africa. Of the 228 species described, barely a dozen now remain in this genus, the rest being mostly referred to allied genera, especially Adenandra, Agathosma and Barosma. Lvs. alternate or opposite, linear-acute, channeled, serrulate or sometimes ciliate, glandular dotted: fls. white or reddish, terminal, subsolitary or corymbose, pedicellate; calyx 5-parted; hypogynous disk, 5-sinuate, 5-plaited; petals 5; style short; stigma capitate. Latest monograph in Flora Capensis, vol. 1 (1859–60). W. M.

Diosma ericoides is more or less well known in America, and is put to various uses in floral decorations, in spray, or branchlets cut to the required length, and stuck in formal designs as a setting for other flowers in the same manner and for the same purpose as Stevia is used, to give that necessary grace and artistic effect to the whole. This species, like most of the genus, has an agreeable aromatic fragrance in the foliage. It is a strong grower, loose and heath-like in habit and foliage, as the specific name indicates; flowers white and small, one or more on the points of tiny branchlets. While Diosmas undoubtedly do best in soil suitable for heaths, that is, soil composed largely of fibrous peat, they are not nearly so exacting in their requirements in this respect, and can be grown in good fibrous loam and leaf-mold in equal parts, with considerable clean, sharp sand added thereto.


716. Native Persimmon—Diospyros Virginiana.
Nearly natural size.

The plants should be cut back rather severely after flowering to keep them low and bushy; this refers more particularly to the above species, other members of the genus being of more compact growth and needing very little corrective cutting to keep them in shape. *Diosma capitata* (now *Ardouinia capitata*) is a fine example of the latter class, and is a much better one than *D. ericoides* for exhibition and show purposes; flowers pinkish lilac, in corymbs of many flowers. The propagation of Diosmas by cuttings is similar to that of heaths, but much easier with the same amount of care. The best material for cuttings is young wood, when not too soft or too hard.

Kenneth Finlayson.

The *Diosma capitata* referred to above was described by Linnæus, but is now referred to *Ardouinia capitata*, Brongn., which belongs in a different order (*Brunìaceæ*) and even in a different subclass of the Dicotyledons. It is a heath-like shrub 2–3 ft. high, with erect branches, and somewhat whorled, mostly clustered branches: lvs. spirally arranged, stalkless, overlapping, linear, 3-angled, roughish, with 2 grooves beneath: fls. crimson (according to Flora Capensis), crowded into oblong, spike-like, terminal heads. Generic characters are calyx adhering to the ovary, 5-cleft, segments large, overlapping: petals with a long, 2-keeled claw, and a spreading, roundish limb; stamens included: ovary half inferior, 3-celled, cells 2-ovuled. style 3-angled, with 3 small, papilla-like stigmas. This plant is not advertised for sale in America.

ericoìdes, Linn. Much-branched: branches and twigs quite glabrous: lvs. alternate, crowded, recurved-spreading, oblong, obtuse, keeled, pointless, glabrous: fls. terminal, 2–3 together, with very short pedicels; calyx lobes ovate, obtuse; petals elliptic-oblong, obtuse. B.M. 2332 under this name is in realty *D. vulgaris*, var. *longifolia*.

D. fràgrans, Sims. = Adenandra fragrans.—*D. vulgàris*, Schlecht., has narrower lvs. than D. ericoides, and they are acute: branchlets minutely pubescent: lvs. scattered, rarely opposite, linear, convex-carinate, subulate-acuminate. There are 5 well-marked botanical varieties. W. M.

DIOSPỲROS (*Dios*, Jove's, *pyros*, grain; alluding to its edible fruit). *Ebenàceæ*. Persimmon. Ebony. Trees or shrubs, with alternate, rarely opposite, entire lvs., deciduous or persistent, without stipules: fls. diœcious or polygamous in few or many-fld., axillary cymes, the pistillate often solitary, yellowish or whitish; calyx and corolla 3–7-, usually 4-lobed; stamens usually 8–16, included: fr. a large, juicy berry, 1–10-seeded, bearing usually the enlarged calyx at the base; seed flat, rather large. About 180 species in the tropics, few in colder climates. The few cultivated species are ornamental trees, with handsome, lustrous foliage, rarely attacked by insects and with decorative and edible fr. The only species which is tolerably hardy north is *D. Virginiana*, while *D. Kaki*, much cultivated in Japan for its large, edible fruits, is hardy only in the southern states. Most species have valuable hard and close-grained wood, and that of some tropical species is known as ebony. They thrive in almost any soil, but require, in cooler climates, sheltered and sunny positions. Prop. by seeds and by cuttings of half-ripened wood or layers; the tropical species by cuttings of mature wood in spring, with bottom heat; the fruit-bearing varieties are usually grafted or budded on seedling stock of *D. Virginiana*. See *Persimmon*.

Virginiàna, Linn. Common Persimmon. Fig. 716. Tree, to 50 ft., rarely to 100 ft., with round-topped head and spreading, often pendulous branches: lvs. ovate or elliptic, acuminate, shining above, glabrous at length or pubescent beneath, 3–6 in. long: fls. short-stalked, greenish yellow, staminate in 3's, ⅓ in. long, with 16 stamens; pistillate solitary, larger, with 4 2-lobed styles, connate at the base: fr. globose or obovate, plum-like, with the enlarged calyx at the base, 1–1½ in. in diam., pale orange, often with red cheek, edible, varying in size, color and flavor. June. Conn. to Fla., west to Kans. and Tex. S.S. 6:252, 253. G.F. 8:265. Mn. 4:21.

Lòtus, Linn. Round-headed tree, to 40 ft.: lvs. elliptic or oblong, acuminate, pubescent, often glabrous above at length, 3–5 in. long: fls. reddish white, staminate in 3's, with 16 stamens, pistillate solitary: fr. black when ripe, globular, ½–¾ in. in diam., edible. June. W. Asia to China. A.G. 12:460.

Kàki, Linn. f. Kaki. Fig. 717. Tree, to 40 ft., with round head: lvs. ovate-elliptic, oblong-ovate or obovate, acuminate, subcoriaceous, glabrous and shining above, sparingly hairy or glabrous beneath, 3–7 in. long: fls. yellowish white, staminate with 16–24 stamens, pistillate to ¾ in. long; styles divided to the base, pubescent: fr. large, 1½–3 in. across, very variable in shape and size, mostly resembling a tomato. June. Jap., China. R.H. 1870, pp. 412, 413; 1872, pp. 254, 255 (as *D. Rox-*

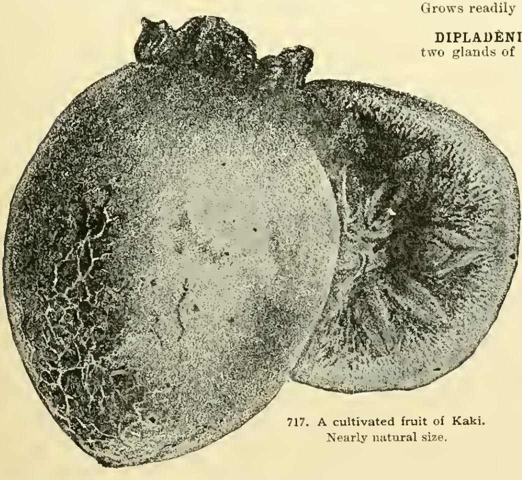
burghi).—Var. **costàta**, Mast. Fr. large, depressed, globular, orange-red, with 4 furrows. R.H. 1870:410. G.C. II. 4:777; Ill. 9:171; 13:51. Gn. 49, p. 171. Var. **Mazéli**, Monillef. Fr. orange-yellow, with 8 furrows. R.H. 1874:70. Other varieties are figured in R.H. 1872, p. 254; 1878:470; 1887;348; 1888:60, and A.G. 12:331–8, 459–62. A very desirable and beautiful fruit-bearing tree for the southern states, where a number of different varieties introduced from Jap. are cultivated, but the hardier varieties from the north of Jap. and China, which are likely to be hardy north to New England, seem hitherto not to have been introduced. Fig. 715 is from Georgeson's articles in A.G. 1891.

AA. *Lvs. small, obtuse or emarginate: corolla and calyx 5-lobed.*

Texàna, Scheele (*D. Mexicàna*, Scheele MS.). Small tree, intricately branched, rarely to 40 ft.: lvs. cuneate, oblong or obovate, pubescent below, 1–2 in. long: fls. with the lvs., pubescent, on branches of the previous year, staminate with 16 stamens, pistillate with 4 pubescent styles, connate at the base: fr. black, ¾–1 in. in diam. Spring. Tex., N. Mex. S.S. 6:254.

D. Ebènum, Koenig. Tree, to 50 ft.: lvs. elliptic-oblong, bluntly acuminate, glabrous: fls. white, staminate, in short racemes. E. Ind., Ceylon. For cult. in hothouses or tropical climates. This species is said to yield the best ebony.

Alfred Rehder.



717. A cultivated fruit of Kaki. Nearly natural size.

DIPCÀDI (meaning uncertain). *Liliàceæ.* Tender bulbous plants of minor importance, allied to Galtonia, with radical, thickish, narrowly linear lvs. and loose racemes of odd-colored fls. on leafless scapes. About 20 species in southern Europe, tropical and south Africa and India. During the winter, their resting time, the bulbs should be kept dry. A compost of light, sandy loam and leaf-mold has been recommended. Latest monograph in Latin, 1871, by J. G. Baker, in Journ. Linn. Soc. 11:395: the South African species in English by Baker, in Flora Capensis, vol. 6 (1896-7).

A. *All perianth-segments equally long.* (*Tricharis.*)

serótinum, Medic. Lvs. 5–6, fleshy-herbaceous, glabrous, narrowly linear, 6–12 in. long, 2–3 lines wide near the base, channeled on the face: scape 4–12 in. long: raceme loose, 4–12-fld.: bracts lanceolate, 4–6 lines long, longer than the pedicels: perianth greenish brown, 5–6 lines long: ovary sessile or subsessile. S. Eu., N. Afr. B.M. 859.

AA. *Outer perianth-segments longer than the inner and tailed.*

filamentósum, Medic. (*D. vìride*, Mœnch). Lvs. 5–6, fleshy-herbaceous, narrowly linear, glabrous, 1 ft. long, 1½–3 lines wide near the base: scape 1–2 ft. high: raceme loose, 6–15-fld.: bracts linear-acuminate, 4–6 lines long: perianth green, 12–15 lines long, outer segments 4–6 lines longer than the inner: capsule sessile. S. Afr.

W. M.

DIPHYLLÈIA (Greek, *double leaf*). *Berberidàceæ.* Umbrella Leaf. An interesting hardy perennial herb with thick, creeping, jointed, knotty rootstocks, sending up each either a huge peltate, cut-lobed, umbrella-like, radical leaf on a stout stalk, or a flowering stem bearing two similar (but smaller and more 2-cleft) alternate lvs., which are peltate near one margin, and a terminal cyme of white fls.: sepals 6, fugacious: petals and stamens 6: ovules 5 or 6: berries globose, few-seeded. This is one of many genera having only 2 species, one of which is found in N. E. North America, the other in Japan. There is a wonderful similarity between the floras of these 2 regions, and few areas have produced so many plants esteemed in cultivation.

cymòsa, Michx. Root-lvs. 1–2 ft. across, 2-cleft, each division 5–7-lobed; lobes toothed: berries blue. May. Wet or springy places in Alleghanies from Va. south. B.M. 1666.—Int. into general trade by H. P. Kelsey. Grows readily in dry soil under cultivation, but is dwarf.

DIPLADÈNIA (Greek, *double gland*, referring to the two glands of the ovary, which distinguish this genus from Echites). *Apocynàceæ.* A charming genus of coolhouse twiners, mostly from Brazil, with large, showy more or less funnel-shaped fls. having a remarkable range of color, rarely white or dark red, but especially rich in rosy shades and with throats often brilliantly colored with yellow. The buds, too, are charming. The genus is fully as interesting as Allamanda, which belongs to another tribe of the same order. Other allied genera of great garden interest are Echites, Ontadenia, Mandevilla and Urechites. Some species are naturally erect bushes, at least when young, and many can be trained to the bush form. The group is a most tempting one to the hybridizer. An all-yellow-flowered kind is desirable. Many names appear in European catalogues, but they are badly mixed, as the genus greatly needs a complete botanical revision. Very many pictures are found in the European horticultural periodicals. Several prizes for American seedlings have been taken at Boston, by Geo. McWilliam, Whitinsville, Mass., who has given a full account of his cultural methods in Gardening, 5:18 (1896).

W. M.

Although Dipladenias are natives of the tropics, they grow at high altitudes, and it is a mistake to keep them in close, steaming hothouses, as many gardeners do in the Old World. The writer has kept them in a house whose temperature was never above 50° F., and frequently went down to 40° on winter nights. Cuttings should be rooted in winter, and the young plants planted outdoors during the summer, being careful not to bury the crowns deep in the soil. They can endure 5 degrees of frost without losing their foliage, but even after 7 degrees of frost and complete loss of foliage, the plants have been lifted, brought into the greenhouse, and flowered with success. A good specimen will have 50–80 open fls. at one time. Tufts of fern root are excellent for potting soil, with some sharp sand added. A fine specimen may be grown in a pan 2 ft. across and 9 in. deep. Plants never need shading. In late fall, as the nights get cooler, the water supply may be gradually reduced until the middle of November, when water is used sparingly until it is desired to start the plants into fresh growth. For points concerning training and pruning, consult Gn. 5:18. GEO. MCWILLIAM.

Few tropical plants excel the Dipladenias as greenhouse twining plants, their handsome sprays of flowers being produced in profusion from May to November, when well grown. The usual method of propagation is by 1- or 2-jointed cuttings of the well ripened growths inserted in sand with brisk bottom heat, when they will usually root very readily. Seeds are not often produced in this genus, though occasionally well grown plants will produce seeds, which should be sown as soon as ripe, in pans of light, peaty soil, with a goodly proportion of silver sand mixed with it, and the pans placed in a warm, moist atmosphere. If given good attention the seedlings will flower the first year. Dipladenias thrive best when potted in fern or kalmia root fiber only. The potting should be attended to in early spring, just before active growth commences. Care must be taken not to injure their tuberous roots, as this will result in weakening very materially the vitality of the plants. Great care must also be exercised in watering until the plants are in active growth, when they will require an abundance of water at the roots; they are also greatly benefited by an occasional watering of clear liquid cow- or sheep-manure water. Frequent spraying of the foliage will also be necessary to keep down the attacks of insects. Dipladenias do best when grown in full sunlight, the roof of an unshaded greenhouse being well suited to them. The pots should be covered with some non-conducting material, however, such as sphagnum moss, to prevent injury to the roots by the heat of the sun. As soon as the season of blossoming is past, the plants should be cut back, and allowed to rest by gradually withholding the water, keeping them during the winter almost dry in a temp. of 55°. EDWARD J. CANNING.

The following kinds sold in America are presumably horticultural varieties which have been insufficiently described:

D. amábilis. Lvs. short-stalked, oblong, acute: fls. rosy crimson, 4–5 in. across; corolla lobes very round and stiff. See Gn. 51, p. 227. Said to be a hybrid of D. crassinoda and D. splendens.—*D. Brearleyàna.* Lvs. oblong, acute, dark green: fls. pink at first, changing to rich crimson, very large. Gn. 51, p. 226.—*D. exímia.* A recent hybrid.—*D. hýbrida.* Lvs. large, stout, bright green: fls. flaming crimson red.—*D. insignis.* Stout growing; foliage strong; fls. rosy purple.

A. *Fls. dark purple.*

atropurpùrea, DC. Glabrous, lvs. ovate, acute: racemes axillary, 2-fld.: peduncles a little longer than the lvs.; pedicels twisted, bracted; calyx lobes lanceolate-acuminate, a little shorter than the pedicel, and a third as long as the cylindrical part of the corolla; corolla tube funnel-shaped above the middle; lobes triangular, wavy, spreading, shorter than the dilated part of the tube. Brazil. B.R. 29:27. Gn. 44:937. I.H. 42:33. Gt. 43, p. 548.—Lvs. about 2 in. long, acute at the very base: petiole ½ in. long; corolla dark purple inside and out; tube 2 in. long. None of the pictures cited above show the fleshy, spreading, scale-like stipules nearly as long as the petioles which De Candolle says are characteristic of the subgenus Micradenia. F.S. 1:33 is said to be *D. atroviolacea* of the subgenus Eudipladenia, in which the stipules are absent or else small and erect. The plate shows a strongly ribbed corolla-tube and lvs. cordate at the base.

AA. *Fls. white: throat yellow inside.*

Boliviénsis, Hook. Glabrous: stems slender: lvs. petioled, 2–3 ½ in. long, oblong, acuminate, acute at base, bright green and glossy above, pale beneath; stipules none: racemes axillary, 3–4-fld.: peduncles much shorter than the lvs., about as long as petioles and pedicels: bracts minute at the base of the twisted pedicels: calyx lobes ovate, acuminate, 3 lines long: corolla almost salver-shaped, tube and throat slender and cylindrical, the former ½ in. long, the latter twice as long and half as broad again: limb 1 ½ in. across; lobes broadly ovate, more acuminate than in *D. atropurpurea.* Bolivia. B.M. 5783. Gn. 44:922. Gng. 7:342.

AAA. *Fls. rose: throat deep rose or purple within, whitish outside.*

spléndens, DC. Fig. 718. Stem glabrous: lvs. subsessile, elliptic-acuminate, cordate at the base, wavy, pubescent, especially beneath, veins elevated, numerous: racemes axillary, longer than the lvs., 4–6-fld.: calyx lobes red-tipped, awl-shaped, as long as the cylindrical part of the corolla tube, which is half the length of the funnel-shaped portion: lobes of the limb rotund, subacute, almost as long as the tube. Brazil. Lvs. 4–8 in. long, 1 ½–3 in. wide, pedicels ½–1 in. long: corolla tube 1 ½ in. long, white outside, lobes rosy, throat deeper, almost purple. Brazil. B.M. 3976. F.S. 1:34 shows a yellow throated form. Var. **profùsa**, Rod. (*D. profùsa*, Hort.), has larger and brighter rosy fls., lined with yellow inside, the outside of the tube rosy except at the base, which is yellow. I.H. 30:491.—Int. by B. S. Williams. *D. amábilis*, Hort., is said to be a hybrid of *D. crassinoda* and *D. splendens.* I.H. 27:396, shows a 12-fld. raceme with exceptionally bright red fls.

718. Dipladenia splendens (× ½).

AAAA. *Fls. salmon-colored: throat yellow inside and out.*

urophýlla, Hook. Named for the long, narrow apex of the leaf. Glabrous, erect bush, not a vine: branches numerous, swollen at the joints: lvs. ovate-oblong, obtuse at the base, suddenly narrowed at the apex into a narrow point ¾ in. long; peduncles long, drooping, flexuose: racemes axillary, 4–6-fld.: calyx segments awl-shaped: corolla dull yellow outside, deeper and brighter yellow within; tube cylindrical in lower third, then swelling into an almost bell-shaped throat; lobes of the limb salmon inclined to purple. acute. Brazil. B.M. 4414. P.M. 16:66. F.S. 5:425.

D. crassinòda, DC. Glabrous: stem much branched, with many nodes: lvs. lanceolate, acute or almost acuminate, acute at the base, shining and leathery on both sides: racemes axillary, about 6-fld.: calyx lobes lanceolate, acuminate, a little shorter than the cylindrical part of the corolla tube, 2 or 3 times shorter than the pedicel; corolla tube bell-shaped above the middle; lobes obovate-orbicular. The above is the original description by De Candolle, who adds that the lvs. are 3–3½ in. long, ¾–1 in. wide, petiole 2–3 lines long: stipules interpetiolar, with 4 short cuspidate teeth. The plant pictured in B.R. 30:64 was renamed D. Lindleyi by Lemaire chiefly for its pilose stem and stellate-lobed stipules. Later authorities refer B.R. 30:64

to D. Martiana. F.S. 22:2310 may be the same plant as B.R. 30·64, but with variable lvs. and stipules. The plant was prized for its delicate colors, being white at first, then shot with soft rose like a flame tulip, and finally a deep rose. Only one flower in a raceme was open at a time, and each lasted 8 or 9 days, throat orange inside. D. crassinoda is said to be a parent, with D. splendens, of D. amabilis. (Gn. 44, p. 141.) *D. Hàrrisii*, Hook.=Odontadenia speciosa.—*D. illùstris*, DC. Glabrous or pubescent: lvs. oblong or rotund, obtuse or nearly acute, rounded or subcordate at the base, many nerved; stipules none; petiole short: racemes terminal, 4–8-fld.: fls. rosy, throat yellow inside, purple at the mouth: corolla tube cylindrical to the middle, then funnel-shaped; limb 3–3½ in. across, lobes rosy, orbicular-ovate, obtuse. Brazil. F.S. 3:256. Var. *glàbra*, Muell. Arg. B.M. 7156.—*D. Sànderi*, Hems., has flesh-colored fls. with throat yellow inside, and outside at the base has smaller lvs. than D. illustris, and no circle of purple at the mouth of the fl. Gn. 51:1111.
W. M.

DIPLARRHÈNA (Greek, *two anthers;* the third being imperfect). *Iridàceæ.* Only 2 species of tender plants from Australia and Tasmania. They belong to the same subtribe with our native Blue-eyed Grass, Sisyrinchium. Rhizomes short: stems terminal, erect, simple or somewhat branched: lvs. in a tuft, narrow, rigid, acuminate, equitant: spathe terminal, rigid, acuminate: fls. whitish; perianth without any tube over the ovary; segments unequal, inner ones shorter, connivent: upper stamen imperfect. This plant is advertised in the American edition of a Dutch bulb dealer's catalogue.

Moræa, Labill. Stems 1½–2 ft. long, with a single terminal cluster, and several sheathing bracts: lvs. 6–8 in a tuft, 1–1½ ft. long, ¼–½ in. wide: spathes cylindrical, 2–3 fld., 2 in. long.

DIPLÀZIUM (Greek, *doubled*). *Polypodiàceæ.* A genus of rather large, coarse ferns allied to Asplenium, but with the indusia often double, extending to both sides of some of the veins, which are unconnected. Eighty or more species are found, mostly in the warmer portions of the world. For culture, see *Ferns.*

A. *Lvs. simple: low plants.*

lánceum, Thunb. Lvs. 6–9 in. long, ¾–1 in. wide, narrowed upward and downward, the margin mostly entire; sori reaching nearer to the edge than the midrib. India, China, Japan.

AA. *Lvs. pinnate, with the pinnæ deeply lobed: rootstock not rising to form a trunk.*

arbòreum, Willd. Lvs. 12–18 in. long, 6–8 in. wide, with a distinct auricle or lobe at the base. The habit is not arboreous, as originally supposed, and as the name would indicate; quite near the next, but less deeply cut. West Indies and Venezuela.

Shépherdi, Spreng. (*Asplènium Shépherdi*, Spreng.). Lvs. 12–18 in. long, 6–9 in. broad, deeply lobed, the lobes at the base sometimes reaching down to the rachis, somewhat toothed and often ¼ in. broad; sori long-linear. Cuba and Mexico to Brazil.

AAA. *Lvs. bipinnate: trunk somewhat arborescent.*

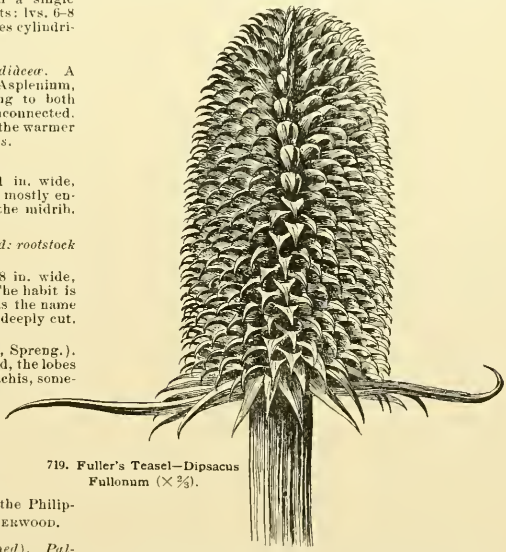
latifòlium, Moore (*Asplènium latifòlium*, Don). Caudex erect, somewhat arborescent: lvs. 3–4 ft. long, 12–18 in. wide, with about 12 pinnæ on either side. India, China and the Philippines.
L. M. UNDERWOOD.

DIPLOTHÈMIUM (Greek, *double sheathed*). *Palmàceæ*, tribe *Cocoíneæ.* Spineless palms, low or stemless, or often with ringed, stout, solitary or fascicled trunks. Lvs. terminal, pinnatisect; segments crowded, lanceolate or ensiform, acuminate, glaucous or silvery beneath, margins recurved at the base, midnerve prominent: rachis 2-faced, strongly laterally compressed; petiole concave above: sheath fibrous, open: spadices erect, long or short-peduncled, strict, thickish: spathes 2, the lower coriaceous, the upper cymbiform, beaked, ventrally dehiscent: bracts short, coriaceous: fls. rather large, cream colored or yellow: fr. ovoid or obovoid, small. Species 5. Brazil.

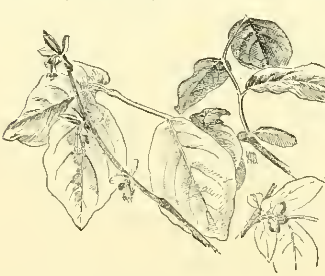
Diplothemium is a small genus of very handsome palms. In size the members of this genus seem to vary as much as those included in the Cocos group. *D. maritimum*, which is found along the coast of Brazil, is but 10 feet in height when fully developed. This genus is without spines, the leaves being pinnate, very dark green on the upper side and usually covered with white tomentum on the under side, the pinnæ being clustered along the midrib in most instances. In a very young plant of this genus the ultimate character is not at all apparent from the fact that the seedling plants have undivided or simple leaves, this characteristic frequently obtaining in the case of *D. caudescens* until the plant is strong enough to produce leaves 4 or 5 feet long. A warm greenhouse, rich soil and a plentiful supply of water are among the chief requisites for the successful culture of Diplotheminums. *D. caudescens* is the best known of the genus, and where space may be had for its free development it is one of the handsomest palms in cultivation.

caudéscens, Mart. (*Ceróxylon níveum*, Hort.). WAX PALM. Stem 12–20 ft. high, 10–12 in. thick, remotely ringed, often swollen at the middle: lvs. 9–12 ft., short petioled; segments 70–90 on each side, ensiform, densely waxy white below, the middle ones 24–28 in. long, 1¾ in. wide, the upper and lower ones shorter and narrower, all obtuse at the apex. Brazil. R.H. 1876, p. 235.
JARED G. SMITH and W. H. TAPLIN.

DÍPSACUS (*to thirst*, from the Greek: the bases of the connate lvs. in some species hold water). *Dipsàceæ.* TEASEL. Perhaps 15 species of tall, stout biennial or perennial herbs of the Old World. The fls. are small and in dense heads, like those of compositous plants, but the anthers are not united (or syngenesious) as they are in the Compositæ. One species, *D. sylvéstris*, Mill., is an introduced weed along roadsides in the northeastern states and Ohio valley. It is biennial, the stem arising the second year and reaching a height of 5 or 6 ft. It is said to be a good bee plant. The Fuller's Teasel, *D. Fullònum*, Linn. (Fig. 719), is probably derived from the former, and differs from it chiefly in the very strong and hooked floral scales. These scales give the head its value for the teasing or raising the nap on woolen cloth, for which no machinery is so efficient. This plant is grown commercially in a limited area in central New York.
L. H. B.


719. Fuller's Teasel—Dipsacus Fullonum (× ⅔).

DÍRCA (Greek, from *dirke*, a fountain; referring to the plant as growing in moist places). *Thymelæàceæ.* Two species of North American shrubs, with tough, fibrous bark, alternate, thin, short, entire, petiolate, deciduous lvs., apetalous perfect fls. in peduncled fascicles of the previous season's growth, the branches developing subsequently from the same nodes: calyx corolla-like, yellowish, campanulate, undulately obscurely 4-toothed, bearing twice as many exserted stamens as its lobes (usually 8): ovary nearly sessile, free, 1-loculed, with a single hanging ovule; style exserted, filiform: fr. berry-like, oval-oblong. Hardy deciduous branching shrubs, often with the habit of miniature trees. Bark of interlaced, strong fibers, and branches so tough and flexible that they may be bent into hoops and thongs without breaking. So used by the Indians and early settlers. The Leatherwood is not one of the showiest of hardy shrubs, but its small, yellowish flowers are abundant enough to make it attractive, and it deserves cultivation especially for the earliness of its bloom in spring. It is of slow growth, and, when planted singly, makes a compact miniature tree; planted in masses or under shade it assumes a straggling habit. It thrives in any moist loam. Prop. by seeds, which are abundant and germinate readily; also by layers.



720. Leatherwood—Dirca palustris (× 1/3).

palùstris, Linn. LEATHERWOOD. MOOSEWOOD. Fig. 720. A shrub, 2–6 ft. high, with numerous branches having scars which make them appear as if jointed, at the beginning of each annual growth, and with yellow-brown glabrous twigs: lvs. oval or obovate, with obtuse apex, 2–3 in. long, green and smooth above, whitish and downy below, becoming smooth, the base of the petiole covering buds of the next season: fls. yellowish, abundant enough to be attractive, nearly sessile, ¼ in. long, falling as the lvs. expand: fr. hidden by the abundant foliage, egg- or top-shaped, ⅓ in. long, reddish or pale green. Woods and thickets, mostly in wet soil N. and S. B.R. 4:292.—Common.

D. occidentàlis, A. Gray. A similar species found on the Pacific coast, differs mainly in the deeper calyx-lobes, lower insertion of the stamens, sessile flowers, and white involucre. Not in the trade, but worthy of cult.

A. PHELPS WYMAN.

DÌSA (origin of name unknown). *Orchidàceæ*, tribe *Ophrỳdeæ*. One hundred or more terrestrial orchids, mostly S. African, of which several are known to fanciers, but only one of which is in the Amer. trade. Sepals free, spreading, upper one galeate, produced in a horn or spur at the base; petals inconspicuous, small, adnate to the base of the column. The species described below is undoubtedly one of the most beautiful of known orchids, but as yet difficult to manage under artificial conditions.

grandiflòra, Linn. FLOWER OF THE GODS. Rootstock tuberous: stems 1 ft. or more high, unbranched: lvs. dark green: fls. several; upper sepal hood-like or galeate, 3 in. long, rose-color, with branching crimson veins; lateral sepals slightly shorter, brilliant carmine-red; petals and labellum orange, inconspicuous. S. Afr. B.M. 4073. G.C. II. 18:521; III. 9:365.

OAKES AMES.

William Watson, in Garden and Forest 9:284, says of Disa: "They all require cool-greenhouse treatment, plenty of water, an open, peaty soil and shade from direct sunshine. As soon as the plants have flowered, they are shaken out of the soil, the suckers taken off, and potted singly in small pots and watered liberally. In November they are again potted into 3-inch pots, in which they remain until they flower. They make a display of flowers for about two months." In G.F. 7:324, Watson writes of *D. Kewense:* "This is a beautiful hybrid, which is as easily grown as any orchid I know of, and multiplies itself by means of offsets with all the prodigality of Couch Grass. Many connoisseurs declare it is the best of all Disas. * * * *D. Veitchii* is a noble plant, and almost as free as *D. Kewense.* I would recommend all growers of orchids to procure both and propagate them as rapidly as possible. * * * The Kew plants are in 4-inch pots, and each bears a spike 18 inches high with from 10 to 20 flowers, each 2 inches across." For portrait of *D. Kewense*, see G.C. III. 18:273.

DISÁNTHUS (Greek, *dis*, twice, and *anthos*, flower; the fls. being in 2-fld. heads). *Hamamelidàceæ.* Shrub, with alternate, deciduous, entire, long-petioled lvs.: fls. similar to those of Hamamelis, but borne in pairs on erect axillary peduncles and connate back to back: capsule 2-celled, with several seeds in each cell. The only species, **D. cercidifòlius**, Maxim., is a shrub, with slender branches, 8–10 ft. high: lvs. roundish-ovate, palmately nerved, 3–4 in. long: fls. dark purple, in October. G.F. 6:215. Hardy ornamental shrub of elegant habit, with distinct, handsome foliage, turning to a beautiful claret-red or red and orange in fall. Prop. by seeds, germinating very slowly, and by layers; probably also by grafting on Hamamelis.

ALFRED REHDER.

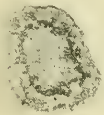
DISEASES of plants are of many classes. The word disease as applied to plants is commonly associated with those manifestations which are the result of seriously disturbed nutrition, rather than with mere attacks of devouring insects. We might classify diseases, for horticultural purposes, as those due to parasitic fungi (or fungous diseases), those due to bacteria or germs, those due to nematodes or eel worms, and those which are associated with disturbed or imperfect nutrition. To these four classes we shall now give our attention:

FUNGOUS DISEASES are those that are due to the invasion of tissue by fungi (see *Fungus*). All crop plants are more or less subject to the attack of these insidious foes, and the havoc they bring is rarely fully appreciated.

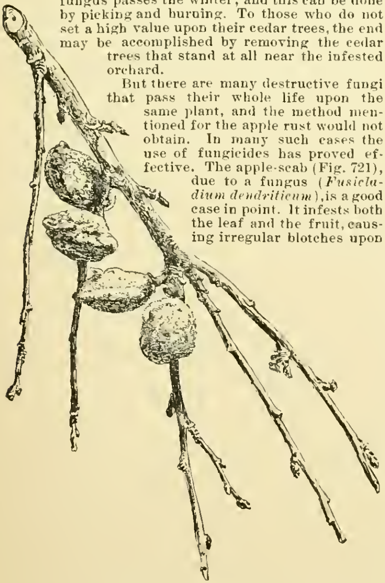
The chief lines of treatment with plants subject to injury from fungi are, first, to reduce the number of spores to a minimum, and, secondly, to surround the plants with conditions unfavorable for their development and yet not to interfere with the growth of the plant itself. Fungi as a rule are fond of moisture and, therefore, dry weather is an ally of the cultivator, while a season with high humidity and a large rainfall is associated with an abundance of plant diseases. So long, therefore, as the weather is without man's control there will be an uncertain quantity in the problem of plant healthfulness.

The growing season for crop plants is practically the same as that for fungi, and during the winter inactivity prevails for both host and parasite. In other words, there are several months of the year when the fungi are either inactive in the host plant or lying dormant outside of it, ready to begin their destructive work. When the plant is a perennial, the fungus may live over winter in its tissue, as is well illustrated in the black-knot, *Plowrightia morbosa*, of the plum and cherry. The swellings upon the twigs increase from year to year until the stem is girdled or otherwise destroyed. The fungus is perennial, and every knot, unless the branch is dead, is the direct starting point for new growth. Along with this fact is the equally important one that in the hard, black crust of the excrescence there are innumerable spherical pits in which countless spores pass the winter, and are ready to spread the disease to new, healthy twigs as the knot breaks up and fresh growth starts in the tree in spring. In the light of the above facts there are many reasons for destroying the knots upon a plum or cherry tree. The limbs affected are practically worthless, and by destroying them the disease is kept from spreading further in the branch and the forming spores are destroyed before they have an opportunity of getting a foothold elsewhere.

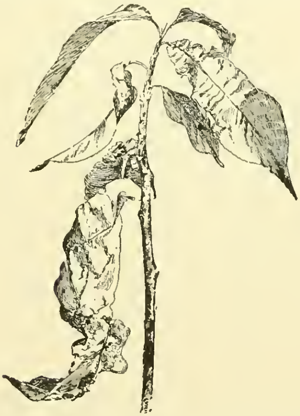
If the horticulturist understands the methods of growth and propagation of a destructive fungus, he is better able to take the step that may lead to the eradication of the pest. Let another example be taken, namely, the apple-leaf rust, which in some parts of the country is a serious menace to the orchardist. It is recognized as yellow blotches upon the foliage, followed by groups of deep cups in the under half of the leaf tissue, where orange-colored spores are produced in great abundance. The life cycle of this fungus, *Gymnosporangium macropus*, involves two hosts; that is, it lives in one stage upon the common red cedar and in the next it infests the apple tree. Upon the cedar the fungus, forms galls of a chocolate color half an inch or more in diameter, which during the spring rains become swollen and have a gelatinous exterior. In this jelly the spores are produced that find their way to the apple tree and there form, after vegetating for a few days, the destructive rust. It is seen that in a case like this the most important thing is to destroy the cedar-galls, for in them the fungus passes the winter; and this can be done by picking and burning. To those who do not set a high value upon their cedar trees, the end may be accomplished by removing the cedar trees that stand at all near the infested orchard.


721 Colony of apple-scab. Natural size.

But there are many destructive fungi that pass their whole life upon the same plant, and the method mentioned for the apple rust would not obtain. In many such cases the use of fungicides has proved effective. The apple-scab (Fig. 721), due to a fungus (*Fusicladium dendriticum*), is a good case in point. It infests both the leaf and the fruit, causing irregular blotches upon both, and frequently destroying the crop. Many experiments have demonstrated that this scab-producing fungus can be kept down by the use of the Bordeaux mixture and various other similar substances. The fungus thrives below the skin of the fruit and the epidermis of the leaf, producing spores in abundance upon the surface. The fungicide, when left in a thin film upon the susceptible surface, prevents the germination of the spores and the entrance of the fungus. It likewise may kill the spores in the places where they are formed and before they have been transplanted to another part of the plant. The fungicide cannot act as a cure in the sense of replacing the diseased, by healthy tissue, but may, by destroying the spores, so prevent the spread that the healthy parts may predominate. In the case of foliage, the spraying is chiefly preventive, and should be particularly directed to the younger leaves, the older ones, with the fungus already established in them, in time falling away. With the ordinary fruits there is no such succession, and the aim is to have each apple or pear coated with the fungicide.


722. Peaches of last year's crop still hanging on the tree, attacked by monilia (× ½).

The branch is dead from the effects of the fungus.


723. Effects of the leaf-curl fungus on peach foliage (× ⅓).

As a rule a fungus that attacks the fruit also infests the leaves, and may likewise thrive in the stems. From this it is gathered that the spray should be very thoroughly applied to all parts of the plant, in order that the foliage may be kept in vigor and make the required food substances for the growth of the fruit, and the latter saved from decay due to direct attack of the fungous germs. But this is not enough. From what has been remarked concerning the hibernation of fungi, it goes without long argument that much can be done by thorough sanitation in the orchard and fruit garden when the crop is off and the plants are at rest. In short, the foliage of a blighted orchard or vineyard is too important to be overlooked in considering the subject of fungous diseases. The pear leaves, for example, may be infested with the leaf-spot, *Entomosporium maculatum*, and spraying may have kept them from falling prematurely and a good crop saved thereby, but the old leaves, as they drop in autumn, are more or less infested with the disease, and, as far as possible, should be destroyed before the winds have scattered them. In the same way the black-rot of the grape (*Læstadia Bidwellii*) may be carried over in the foliage and the mummy berries that are left upon the vines. Here, again, the spray pumps can be largely supplemented by picking, pruning and burning. In the winter care of vineyards we can take a lesson from the grape growers of Europe, where much care is taken to clean up after every crop. They do not stop with the gathering of the refuse, but spray the leafless vines in winter, and the trellises as well, with Bordeaux or plain solution of cupric sulfate. The subject of remedies for fungous diseases would be slighted were not emphatic words used in this connection. It is folly to delay the use of remedial measures until after the fungi are in evidence. With many quick-acting diseases it is then too late, and in fact with some the spray pump, when the trees are in full leaf and fruit, is of secondary importance. The fruit-rot or gray mold (*Monilia fructigena*) of the cherry, plum and peach is of this type. To eradicate this pest, it is not enough to wait until the disease is in the trees, for then, if the weather is warm and moist, the crop is destroyed. Here, again, the work of prevention should begin the winter before; by destroying all mummy fruit (Fig. 722) and blighted branches the disease is attacked at its weakest point.

Another point in this connection that must be kept in mind is the general health of the plant. Every tree or shrub should be well nourished and come to its appointed task in good health. This means the best form of the plant for the purposes intended, obtained by the use of the pruning knife or other means. Fungi do not love the sunshine half as well as the shade, and an open-topped tree needs less spraying than one with the branches crowded. This will also obviate in some measure another point of weakness, namely, overloading. A peach tree attempting to carry a double complement of fruit will breed more decayed fruit and foliage than many that are not overloaded. Thinning, in other words, is often as essential to healthfulness as spraying, and a congenial soil and situation are more important than either. Naturally, the question of remedies for fungous diseases comes in only after all the conditions for the best growth of the plants have been met.

The number of fungi injurious to the horticulturist is large, and space permits of the mention of but a few under the several crops. Apples: Aside from the rust and scab used above for general illustration, there are the ripe-rot (*Glæosporium fructigenum*); powdery mildew (*Podosphæra Oxyacanthæ*), and the fire-blight (*Bacillus amylovorus*). The first of the three grows also upon the grape, and the fire-blight attacks the pear and the quince, upon the former being a serious enemy. In this fire-blight we have a bacterial disease in plants, that resides during the winter in the twigs, and is conveyed to flowers by insects which gather on the ooze of cracked, blighted stems in spring. All such diseased branches should have been previously removed. Quinces: The black-rot (*Sphæropsis malorum*) and rust (*Ræstelia aurantiaca*, are often destructive. Plums, in addition to the black-knot, have leaf-blight (*Cylindrosporium Padi*), while the cherry has the "shot-hole" fungus (*Septoria cerasina*). Peaches are sometimes much afflicted with the leaf-curl (*Exoascus deformans*, Fig. 723), and the scab or "gray back" (*Cladosporium carpophilum*). The most obscure disease of the peach is the "yellows," a name given to a contagious disorder that manifests itself in a premature ripening of the fruit, which takes on an unnatural spotting of red or purple, with the flesh streaked and the taste insipid. The affected trees produce tufts of small branches upon the elder branches, with slender leaves, known as "Pennyroyal sprouts" or "willow shoots." Trees with these "bushes" are fit subjects for the burn heap.

724. Currant foliage attacked by the leaf-spot fungus (× ½).

Of the small fruits, the grape leads in the number of fungi, the black-rot and ripe-rot previously mentioned being among the chief, while the anthracnose (*Sphaceloma ampelinum*) and downy mildew (*Plasmopara viticola*) are quite destructive. Blackberries and raspberrise suffer from similar diseases, the leading ones being the rust (*Puccinia Peckiana*), requiring the destruction, root and branch, of the infested plants, and the anthracnose (*Glæosporium venetum*), amenable to spraying. Currants and gooseberries are similarly akin, and have nearly the same fungi ,as leaf-spot(*Septoria Ribis*, Fig. 724) and anthracnose (*Glæosporium Ribis*), in addition to which the gooseberry is badly troubled with a mildew (*Sphærotheca Mors-Uvæ*), that may be kept off by sulfide of potassium, one ounce to two gallons of water, as a spray. Strawberries have the leaf-blight (*Sphærella Fragariæ*, Fig. 725) as the leading fungous trouble, and this sometimes requires heroic treatment, even to the burning over of the bed in autumn to destroy the infested leaves and the germs they contain.

725. Strawberry leaf rolled up from the attack of the leaf-blight. Natural size.

Annual Plants. In the previous discussion, perennial crop plants only have been considered. With the annuals the treatment is in large part the same, except that there are no live plants in winter to be considered, no stems and branches to be cleansed, and there is the very important difference that it is possible to grow the annuals upon new ground each season. While it is impossible to move the vineyard or fruit garden, it should be the rule not to grow an annual upon the same piece of soil continuously. In one sense the grower can move away from his troubles by practicing a judicious rotation of crops. However, the truck grower and the gardener in a small way should not trust entirely to this itinerancy, but instead should place the spraying machine upon the same footing as the plow or planter as a necessary implement; and as insects compete with fungi for the possession of his crops he should spray for both, and usually this can be done at the same time. The spraying of crops like potatoes, beans, egg-plants and celery, can be done with great rapidity with the cart machines.

With the annual crops the idea of cleaning up and burning the rubbish should be enforced as thoroughly as with the tree crops. The burn heap is a successful ally of the spray pump, and with the rotation suggested, growers of vegetables and vegetable fruits should hope to be exempt from serious fungous attacks, except when the weather is unusually favorable for the excessive development of blights and rots.

Some of the leading fungous enemies upon the vegetable fruit plants are the anthracnose (*Colletotrichum Lagenarium*) and bacteriosis (*Bacillus Phaseoli*) of the bean, both held in check by Bordeaux; the leaf-spot (*Ascochyta Pisi*) and mildew (*Erysiphe Martii*) of the pea; leaf-spot (*Septoria Lycopersici*), black-rot (*Macrosporium Tomato*) and bacteriosis (*Bacillus Solancearum*) of the tomato; leaf-spot (*Phyllosticta hortorum*) and stem-rot (*Nectria Ipomœa*) of the egg-plant; and anthracnose (*Colletotrichum Lagenarium*) of melons and cucumbers.

Among vegetables strictly so-called, there is the leaf-blight (*Cercospora Apii*) and bacteriosis of celery; mildew (*Peronospora effusa*) of spinach; smut (*Urocystis Cepulæ*) of onions; rust (*Puccinia Asparagi*) of asparagus; club-root (*Palsmodiophora Brassicæ*) of cabbage, and mildew (*Bremia Lactucæ*) of lettuce.

The root crops have their subterranean fungous enemies, and for these a soil treatment is necessary. For the club-root of turnips and cabbage, named above, and allied plants, lime is a preventive when added to the soil, 35 bushels per acre; while the scab (*Oospora scabies*) of the round potato is checked by soaking the seed in a weak solution of corrosive sublimate, or by flowers of sulfur added to the soil, 300 pounds per acre. The same treatment is effective for onion smut and the fungous diseases of the sweet potato. Use a new field each year whenever possible. In short, feed and care for the crops well, so that the plants will be perfectly at home in the place assigned them, and then use fungicides as an enlightened judgment dictates, not forgetting to destroy the autumn rubbish, the winter hiding places of the insidious germs of disease. See *Fungicide*.

Bacterial Diseases.—There is much damage done to higher plants by infesting bacteria. These low organisms may flourish in leaf, stem or root, and with some crops they are widespread and destructive. One of the most prominent of the bacterial diseases is the fire-blight of the pear, apple and quince, due to the *Bacillus amylovorus*, the germs of which multiply in the nectar of the blooms with great rapidity, and are carried from one flower to another by insects, and in this way an orchard may become infected. From the blossoms the disease extends downward into the branches or runs in from lateral fruit-spurs and girdles the limbs. The blight also enters through the tips of growing branches, as in the nursery when plants are too young to bear flowers. This is "twig-blight," as distinguished from "flower-blight," while a third form is a "body-blight," where the germs attack the main stem of the tree through the buds that may be found there. Warm, moist weather, with frequent showers, favor the spread of the disease, and with opposite conditions the germs may die out, even when in the cambium and protected by the bark. The germs, when they live over winter in the branch, may reach the surface as ooze from the blighted parts in spring and be carried by insects to the flower and other buds. As yet there is nothing better for a remedy than the removal of the blighted twigs, cutting well below where the dead adjoins the living bark. Trees highly fertilized with nitrogenous manures are especially subject to blight and, therefore, over-stimulation with manure is to be avoided, and upon very rich soil an orchard may do better in sod.

The above is a fair type of the bacterial diseases of ligneous plants. Among the many upon herbs, there is one that is very destructive to tomatoes, the *Bacillus solanacearum*, which is recognized by a sudden wilting of the foliage, followed by a yellow or brown color. Here, again, the germs are transmitted by insects as Colorado and flea beetles. One of the chief preventive measures, therefore, is to protect the tomatoes by insecticides, and when any plant is diseased it should be destroyed. Other plants allied to the tomato, as potato, egg-plant, petunias and the common weeds, as Jamestown weed, nightshade and ground cherry, are affected with the same disease; and, therefore, clean culture is demanded, and also a wide rotation of crops upon soil liable to bear infected plants.

A similar bacterial disease is met with in sweet corn, due to *Pseudomonas Stewarti;* while other species attack sorghum and a long list of field and garden crops, particularly the roots like beet, carrot, turnip and similar plants, as the bean, onion and celery. Sprays do not seem to materially check these diseases, and the chief means of combating them are through soil sanitation and a judicious rotation.

Nematodes.—There are many troubles experienced by plants that are due to animals. None of these are more abundant and destructive than the nematodes, namely, microscopic worms, that infest various parts of plants, but the roots in particular, when they cause enlargements known as root-galls. As the conditions of continued warmth and moisture favor these eel worms, they are more frequently found in destructive numbers in the plant house. Roses are particularly subject to nematodes, which upon their roots cause a multitude of small swellings. The same is true of violets, with which they have been very serious at times. Cucumber, tomato, cyclamen, coleus (see Fig. 518, p. 351), and other plants are likewise attacked.

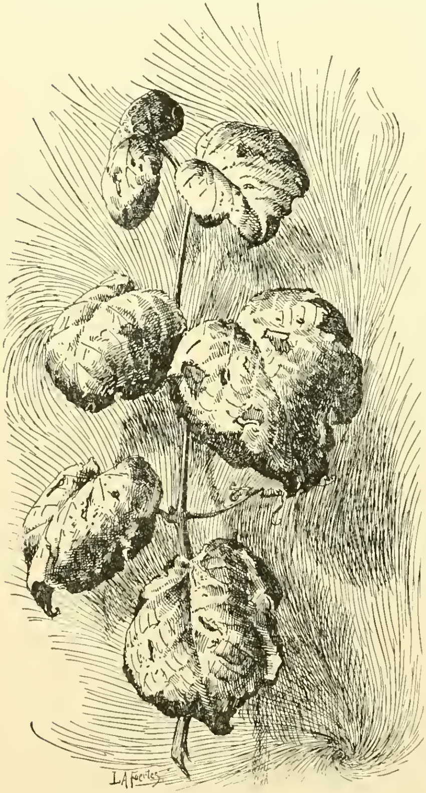
It is thought that lime added to the soil has been beneficial, but the most effective method of exterminating these pests is by heating the soil by steam up to at least 180°–212° F. for one hour or more before being used in the pots or benches. The nematodes are killed by freezing, and probably on this account the number of these worms in field crops is kept within bounds at the north, while they are a menace to field crops at the south. In greenhouse work, take care that no soil is used which has not been thoroughly frozen since it bore a crop of indoor stuff.

Imperfect Nutrition.—There are doubtless many ills of plants due directly to lack of proper physical conditions. Some are overfed, others are starved, some are drowned, and many perish from protracted thirst. Aside from all this, plants will sicken even when the ordinary conditions seem satisfactory. For some reason not easily assigned, a change will come over the plant, the activities of growth are checked or cease, and the plant dies and without any cause that falls under the previous heads. Some physiological defect is charged with the cause, and various terms have been used to conceal the manifest ignorance. The "yellows" of the peach seems

726. Disease of Cucumber leaf (× ½).
The dying margin indicates that the trouble is due to some interference with the food supply.

to be one of this class, and is as interesting to the vegetable pathologist as it is destructive to the orchardist. The latest view of this particular form of disorder is that of the unorganized ferment, which by causing certain chemical changes in the substances of the cells brings about the peculiar and well marked malady of the "yellows." If we start with the premise that there is a certain small amount of chemical ferment in all plants, it is only necessary to have this increased to get the results in question; and how to prevent this augmentation is the practical point at issue. This ferment in active form might be communicated from one plant to another by budding or grafting, and, instead of introducing living germs, it is a transmission of a germless ferment like diastase, that is found in seeds, and does its appointed work as a solvent, in the period of germination.

There are other disorders that are called "Œdema," or a dropsical form of disease. The tomato is subject to this, and pelargoniums likewise. Tumors are formed, or the leaves bear translucent dots along the veins. This trouble is most apt to appear with greenhouse plants in early spring, and may be favored by lack of sunshine, especially if the warm soil is wet and root action is excessive. The remedy lies in furnishing, so far as possible, the conditions opposite to those above named.



727. A blight of grapes due to some constitutional disorder. Notice that the leaves die first at the edges (× ½).

In general, it may be said that diseases which are due to germs or to malnutrition show the disorder more or less generally spread over the plant, rather than confined to local areas. For example, if the foliage shows a general wilting, it is evident that the trouble lies farther back than the leaves themselves. If one leaf begins to die all around the edge (as in Fig. 726), it is indication that the trouble is a cutting off of food supply in the entire leaf; the trouble may be near the base of the leaf, or farther back. After a time, the leaf becomes dry and brittle, and the winds break it. In Fig. 727 it is evident that the trouble is in the whole branch.

Byron D. Halsted.

DISHCLOTH GOURD. See *Luffa.*

DISPÒRUM (Greek, *double pored*). *Liliàceæ.* Perennial herbs with the appearance of our much-loved eastern Bellwort or Uvularia, but distinguished by an indehiscent berry, while Uvularia has a capsule that splits down the back of each cell. In 1879, Bentham and Hooker proposed to include Prosartes in this genus. The American species of Prosartes are said by S. Watson to differ from the Asian ones in having their ovules hung from the top of the cell instead of ascending from the base, but in one American species, *D. trachycarpa*, they are fixed on the sides, as they are also in one Himalayan species. The habit of all is said to be alike. Latest monograph of both genera by Baker in Journ. Linn. Soc. 14:586, 588 (1875); of the American species of Prosartes by S. Watson, in Proc. Am. Acad. 14:270 (1879).

These plants have been little tried in the eastern states, and are probably not hardy without some winter covering.

A. *Lvs. rarely cordate at base: stigma 3-cleft.*

B. *Perianth very broad and unequally rounded at the base.*

Ménziesii, Nicholson (*P. Ménziesii,* Don). More or less woolly-pubescent: stem 2–3 ft. long, forking, arching above: lvs. ovate to ovate-lanceolate, narrowly acuminate or the lowest acute, sessile, 2–3 in. long, often resin-dotted: fls. 1–3, greenish, from the topmost axils, nodding, 7–9 lines long; pedicels puberulous; perianth segments nearly erect, acute, 6–11 lines long; stamens a third shorter; anthers included, 1½–2 times shorter than the filaments: berry 3–6 seeded: cells 1–2-seeded: fr. oblong-obovate, narrowed to a short beak. Calif. to B. C.

BB. *Perianth narrow and more wedge-shaped at the base.*

lanuginòsum, Nicholson. Woolly-pubescent: lvs. oblong-lanceolate, narrowly acuminate: perianth-segments greenish, linear-lanceolate, acuminate, spreading, 6 or 7 lines long, stamens a third shorter; style and narrow ovary glabrous: capsule oblong-ovate, obtusish or with a very short, stout beak, glabrous; cells 1–2-seeded. W. N. Y. to Ga. and Tenn. B.M. 1490.—Int. by H. P. Kelsey.

trachycárpum, Hook. & Jack. (*P. trachycárpa,* Wats.). More or less pubescent: stem 1–1½ ft. high, forking, with foliage on the upper half: lvs. ovate to oblong-lanceolate, acute or rarely acuminate, 2–4 in. long: pedicels pilose; perianth-segments whitish, slightly spreading, more narrowly oblanceolate than in *D. Menziesii*, acute, 4–6 lines long, about as long as the stamens: berry many-seeded; cells 2–6-seeded: fr. broadly obovate, obtuse, rather deeply lobed, papillose. Saskatchewan to N. Idaho, Utah and Colo.

AA. *Lvs. mostly cordate-clasping.*

Oregànum (*P. Oregàna,* S. Wats.). More or less woolly-pubescent: lvs. ovate to oblong-lanceolate, long-acuminate: perianth segments spreading, acute, narrowed below, very distinctly net-veined, 5–7 lines long, as long as or shorter than the stamens: fr. ovate, acutish, somewhat pubescent; cells 1–2-seeded. Oreg. and Idaho to B. C.

The following kinds are cult. abroad: *D. Hoòkeri,* Nicholson (P. lanuginosa, var. Hookeri, Baker). Before D. Oreganum in the key. More or less rough-pubescent, with short, usually spreading hairs: lvs. ovate or sometimes oblong: perianth rather broad at the base: fr. obovate, obtuse; cells usually 2-seeded. Calif. Baker regards this as a more robust form of

D. lanuginosum, less puberulous, with lvs. wider, more deeply cordate at the base, and clasping the branches.—*D. Leschenaultiànum*, D. Don, differs from the others here described by having white fls. India, Ceylon. B.M. 6935.—*D. púllum*, Salisb. Readily told from American forms by its brown or purplish green fls. India, Java, China. B.M. 916.

W. M.

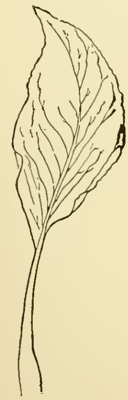
DÍSTICHLIS (Greek, *two-ranked*). *Gramineæ*. Salt-grass. Marsh Spike-grass. *D. spicàta*, Greene, is an upright, wiry grass, 10–20 in. high, with strong, extensively creeping rootstocks. A Salt-grass found on the coast of both continents, and thrives even in ground heavily crusted with alkali and other salts. Prospectors and miners consider its presence a sure sign of water near the surface. Good grass for binding loose sands or soils subject to wash. Not cult.

P. B. Kennedy.

DISTÝLIUM (Greek, *two styles*). *Hamamelidàceæ*. An oriental genus of two species of evergreen trees, one of which has variegated foliage, and is used for hedges in China and Japan. The genus is very unlike our Witch Hazel, as it has no petals, a superior ovary and 2–8 stamens. Lvs. alternate, thick, leathery, ovate or oblong-lanceolate, entire: fls. small, polygamous. Seeds and young plants of **D. racemòsum**, Sieb. & Zucc., may be obtained through dealers in Japanese plants.

DITTANY is an old English word which in England often means *Dictamnus albus*, a plant of the rue family. The name is supposed to be derived from Mt. Dicte, in Crete, where the ancient Dittany grew. The Cretan Dittany is supposed to be *Origanum Dictamnus*, a plant of the mint family, and of the same genus with the wild marjoram. The plant commonly called Dittany in the eastern U. S. is *Cunila Mariana*, Linn. (*C. origanoides*, Britton), another mint. It has been used as a substitute for tea, and is a gentle aromatic stimulant. All these plants yield an oil used as a mild tonic.

DOCK. A name applied to various species of Rumex (of the *Polygonàceæ*). The commonest species—growing in fields and yards—are the Curled or Narrow-leaved Dock (*R. crispus*, Linn.), and the Bitter or Broad-leaved Dock (*R. obtusifolius*, Linn.). These are introduced from the Old World. Several species are native.



728. Spinage Dock.

729. Belleville Dock.

Various species of Docks and Sorrels have long been cultivated as pot-herbs. Some of them are very desirable additions to the garden because they yield a pleasant food very early in spring, and, once planted, they remain for years. The Spinage Dock and the Large Belleville are amongst the best kinds. The former (Fig. 728) is the better of the two, perhaps, and it has the advantage of being a week or 10 days earlier. The crisp leaves (blade 1 ft. long) appear early in April, when there is nothing green to be had in the open, and they can be cut continuously for a month or more. This Dock is the Herb Patience (*Rumex Patientia*, Linn.). It has long been an inhabitant of gardens, and it has sparingly run wild in some parts of this country. It is a native of Europe. The Belleville (Fig. 729) is also a European plant, and is really a Sorrel (*Rumex Acetosa*, Linn.). It has also become spontaneous in some of the eastern portions of the country. It has thinner, lighter green and longer-stalked leaves than the Spinage Dock, with spear-like lobes at the base. The leaves are very sour, and will probably not prove to be so generally agreeable as those of the Spinage Dock; but they are later, and afford a succession. In some countries this Sorrel yields oxalic acid sufficient for commercial purposes. The round-leaved or true French Sorrel (*Rumex scutatus*, Linn.) would probably be preferable to most persons. All these Docks are hardy perennials, and are very acceptable plants to those who are fond of early "greens." Some, at least, of the cultivated Docks can be procured of American seedsmen.

L. H. B.

DOCKMACKIE. *Viburnum acerifolium.*

DODDER. See *Cuscuta.*

DODECÀTHEON (Greek, *twelve gods*). *Primulàceæ*. Shooting Star. American Cowslip. Hardy herbaceous plants, with flowers that are never forgotten after the first sight. Shooting Star is a capital name. The flowers have been compared to a diminutive cyclamen, for they are pendulous and seem to be full of motion (see Fig. 730). The stamens in *D. Meadia* and all eastern species come to a sharp point and seem to be shooting ahead, while the petals stream behind like the tail of a comet. The fls. represent every shade from pure white, through lilac and rose, to purple, and they all have a yellow circle in the middle, i. e., at the mouth of the corolla. Dodecatheon is a most puzzling genus to systematic botanists. It is found from Maine to Texas and from the Atlantic to the Pacific; and along the Pacific slope, from the islands of Lower California to those of Behring straits. In this vast region, it varies immensely. It is also found in Asia, especially northeastward. This wonderful distribution and variability is all the more remarkable if, as Gray believed, it is all one species, because monotypic genera are considered, as a rule, to be comparatively inflexible or invariable. Dodecatheon belongs to the same order with Primula and Cyclamen, but in a different tribe from the latter, while its reflexed corolla lobes distinguish it from the 10 other genera of its own tribe. For the honor of American horticulture, it is a pity that the improvement of these charming American plants should have been left to English and French horticulturists. An important era in their amelioration was probably begun with the introduction of the *D. Jeffreyi* from the Rocky Mts., first pictured about 1866, which was stronger-growing than the common or Atlantic type, with longer and erect lvs. (not crowded in a flat rosette), and with larger fls. and more of them. The improvement of the Shooting Stars is very recent. Twenty-six horticultural varieties are given in 1897 in R.H., p. 380. The best kinds are robust in habit, with 12–16 large fls., the main colors being white, lilac, rose, violet, and deep purplish red, with many delicate intermediate shades. After the fls. are gone the pedicels become erect. Some species have all their parts in 4's. The best picture of the most advanced types is R.H. 1898: 552. For other pictures, see B.M. 12. Gn. 10: 41 and 24: 414. Gng. 5: 295. Mn. 4: 65.

Of their culture, J. B. Keller says: "All they require is an open, well drained soil, not too dry, and moderately rich, and a shady or partially shady position. In a sunny border the fls. are of short duration. The rockery with a northern or eastern aspect suits them to a dot. They are prop. by division of the crowns, or by seeds, the latter method being rather slow." J. W. Manning advises a cool spot in rich loam. The lvs. disappear after flowering and do not appear again until the next spring. Shooting Stars are said to be easily forced. The best varieties at present are obtained from Europe.

The genus Dodecatheon is much confused: that is, it is differently understood by different authors. In the Synoptical Flora, 1878, Gray accepted but one species, *D. Meadia*, and referred all the known forms to six varieties of it. Later (Botanical Gazette 11:231) he revised his view of the genus, and recognized five species. A synopsis of this latter view is here given, and it is followed by a conspectus of the latest view of the genus by Professor Greene. Various garden names are not accounted for in either sketch, nor is it possible to refer them to their proper places without studying the plants themselves; and these forms are Old World productions, and are not known to be in the American trade.

730. Shooting Star—Dodecatheon pauciflorum (×¼).

A. *Anthers on evident filaments, the latter being inserted at the very orifice of the short corolla-tube and distinctly monadelphous: lvs. with tapering base.*

B. *Capsule acute, opening at the apex by valves.*

Mèadia, Linn. COMMON or EASTERN SHOOTING STAR. Roots fibrous: lvs. 3–9 in. long, crowded on a thickish crown, spatulate oblong or oblanceolate, entire or nearly so, sometimes repand obtuse, below tapering into more or less of a margined petiole: scape 9–24 in. high: fls. few to many in an umbel. Penna. south and west.—*D. integrifolium*, Michx. (B.M. 3622) is regarded by Gray as probably synonymous, but in European horticulture it seems to be loosely used to distinguish an entire-lvd. from a dentate form.

BB. *Capsule obtuse, opening at or from the apex by valves.*

Jèffreyi, Moore. Large: lvs. from narrowly or elongated to obovate-spatulate: capsule oblong or cylindrical, usually much surpassing the calyx. Pacific coast. F.S. 16:1662, which represents a strong plant with erect root-lvs. 1 ft. long, and purplish red fls. twice as large as any cultivated before 1865–7. The name is sometimes spelled *Jeffrayi* and *Jeffreyanum*. To this species, Gray provisionally referred his vars. *alpinum* and *frigidum*. The former appears to be the *D. alpinum*, Hort.

ellipticum, Nutt. (*D. Mèadia*, var. *brevifòlium*, Gray). Distinguished by its globular or short-ovoid capsule, barely equaling or slightly surpassing the calyx; also by the short and blunt anthers: lvs. short, obovate or oval, with cuneate base. Cal. and north.

BBB. *Capsule obtuse, thin, more or less cylindrical, surpassing the calyx, dehiscent by a circumscission of the apex.*

Héndersoni, Gray. About a foot high: lvs. small, obovate: fls. like those of *D. ellipticum*. Idaho to Calif. and north.

AA. *Anthers seemingly sessile, the very short filaments inserted below the orifice of the corolla.*

frígidum, Cham. & Schlecht. (*D. Mèadia*, var. *frígidum*, Gray). Lvs. obovate to oblong, very obtuse, mostly entire: calyx-lobes longer than the tube: capsule oblong. Behring straits to Rockies and Sierras. B.M. 5871.

Var. **dentàtum**, Gray (*D. dentàtum*, Hook. *D. Mèadia*, var. *latílobum*, Gray). Larger: lvs. with blade 1–4 in. long, oval or ovate to oblong, repand or sparingly dentate, abruptly contracted into long winged petioles. Utah, west and north.

Following are mostly Old World horticultural forms: *D. Lemóinei*, Hort. Said to be a hybrid between D. integrifolium and D. Jeffreyi, and intermediate in character.—*D. Lemoinei*, var. *robustum*, is like D. integrifolium, but more robust and erect, with larger fls., which are purplish rose, circled with white.—*D. màximum*, Hort. Fls. rose.—*D. Mèadia*, var. *elegans*, Hort. Lvs. wider and shorter: scape shorter: fls. more numerous, dark colored.—*D. Mèadia*, var. *gigantèum*, Hort. Much larger than the type in all its parts: lvs. paler: fls. a little earlier. There is a white-fld. variety of it.—*D. Mèadia*. var. *splèndidum*, Hort. Fls. 4–10, crimson, with a yellow circle, —*D. tetrándrum*, Suksdorf, has the general aspect of D. Jeffreyi, but the lvs. are ampler and relatively broader. Roots, as in D. Jeffreyi, are abundant, fleshy-fibrous, persistent: roots, lvs. and scapes form a short, vertical crown: whole plant glabrous: corolla purplish, with a yellow ring near the base; segments and stamens usually only 4: capsule circumscissile very near the apex. Mountains, apparently throughout eastern Washington and Oregon. Quite distinct from D. Jeffreyi, though it is the nearest ally of that species; but it belongs to another tract of country. Fully described by E. L. Greene in Erythea, 3:40 (1895). Introduced to cultivation in the east by F. H. Horsford in 1899.

W. M.

ANOTHER VIEW OF DODECATHEON.—The species fall into two well-marked groups: lowland species, which flower in winter and rest during the long, dry summer; and subalpine species, which rest in winter and flower in the subalpine spring of July and August. Species of the lowland group propagate by bulblets formed on the crown of the root. In the following notes, only some of the leading species of different regions are taken up. They are not all in commerce.

A. *Lvs., roots and scapes from a short, vertical crown.*

B. *Anthers long, sharp, convergent; capsules valvately opening from the top.*

Mèadia, Linn. Lvs. oblanceolate or spatulate-oblong, 6–9 in. long, toothed more or less irregularly, of a light green: fls. from deep lilac-purple to pinkish. Ranges from Maine to perhaps Texas, east of the mountains.—The Allegheny mountain plant is entire-leaved, and is the *D. integrifolium* of Michx.

crenàtum, Raf. Stouter, and of more fleshy texture than the last; foliage deep green, crenate rather than dentate: fls. more numerous in the umbels, equally variable in color. Inhabits either low prairies or moist woodland borders of the upper Mississippi prairie region.

cordàtum, Raf. Very light green, thin foliage, each leaf made up of broad, subcordate, crenate blade and distinct though broad petiole twice the length of the blade: fls. very few in the umbel, pale pink or white, but with very dark purple ring at base. Cult. at Philadelphia early in the nineteenth century, and named and described by Rafinesque, the habitat not then known, but it is now known to inhabit the limestone region of southern Illinois and adjacent Missouri, along with a few other equally rare and local plants. A most distinct species by its foliage.

BB. *Anthers obtuse, forming a column (not convergent).*

C. *Capsules opening valvately: alpine species, or at least subalpine, blooming in summer, resting in winter.*

paucìflòrum, Greene. Fig. 730. Variable in size, 6–18 in. high, but slender: hairs oblanceolate, entire, suberect, 3–5 in. long: fls. often few in the umbel, sometimes many, half the size of those of *D. Meadia*, usually deep purple: filaments long, united into a slender tube; column of blunt anthers relatively short. Exclusively of the Rocky mountain region and subalpine.

alpìnum, Greene. Smaller than the last, but with fls. twice as large and always with parts in 4's; filaments very short, wholly disconnected: lvs. narrowly oblanceolate or almost linear: corolla of a rich, dark purple. Peculiar to the high Sierra Nevada and Cascades.

Jéffreyi, Moore. Lvs. oblanceolate, erect, entire, mucronate, 5–10 in. long: scape 1–1½ ft. high: fls. 4-merous; pedicels and calyx hairy and glandular: segments of the large corolla dark purple; stamens disconnected, dark purple: capsule not exceeding the calyx. High Sierra Nevada and Cascades.

cc. *Capsules circumscissile at top, this part falling off as a lid. Californian lowland, winter-blooming species, with broad, depressed lvs. except in D. Clevelandi.*

Héndersoni, Gray. Lvs. obovoid, very obtuse, entire, depressed, thick and glossy: scapes 8–12 in. high: segments of corolla rose-purple, the base dark maroon encircled by a band of yellow: capsule oblong, twice the length of the calyx. Calif. to Brit. Columbia.

cruciàtum, Greene. Foliage as in the last: scapes taller, more slender, few-fld.; parts of fl. in 4's; corolla of a darker purple; anthers more elongated; capsule longer. Coast Range of Calif.

pátulum, Greene. Lvs. as in the foregoing, nearly, but stout scapes only 3–7 in. high: umbel very many-fld.: corolla large, with pale cream-colored segments, sometimes purplish tinged: tube of a dark, velvety maroon-purple: anthers very short and broad, of a deep blue-purple: capsule subglobose, hardly surpassing the calyx. Plains of the interior of middle Calif.

These three species have, among other peculiarities, that of propagating by their roots. Each root, after flowering time, thickens and shortens, detaches itself from the ground and forms a bud at the end, thus becoming a new plant.

Clèvelandi, Greene. Lvs. more elongated, not depressed: scape tall and stout; umbel very many-fld.; corolla usually rose-purple, with yellow base and some dark velvety spots next the stamens, these very short and broad, purple. Dry hills of southern Calif.—Most beautiful species; winter-blooming like the foregoing, but not propagating by root-metamorphosis.

AA. *Lvs. and scapes from a horizontal rootstock, this rooting from beneath. Far northwestern species.*

dentàtum, Hooker. Pale green, white-fld. species, with broad, subcordate lvs. as in *D. cordatum* of the southeastern states, but anthers blunt; lvs. coarsely dentate, but the horizontal rootstock must, as well as the blunt stamens, prevent its being confused with *D. cordatum*. Washington and Brit. Columbia.—Apparently rare.

frigidum, Cham. & Schlecht., is a similarly rhizomatous species, but with purple fls., from the shores of Behring sea. Is not in cult., nor likely to be.

vivíparum, Greene, is a very large and handsome, purple-fld. species; subalpine on Mt. Rainier. In the axils of the lvs., along the thick rootstock, bulblets are produced, by which it propagates. Its capsule opens by a lid, as in many far-western species. E. L. GREENE.

DODONÆ̀A (from the Greek name of a famous oracle of Jupiter). *Sapindàceæ.* About 50 species of trees and shrubs, widely scattered, but especially abundant in Australia. Lvs. alternate, without stipules, simple or abruptly pinnate, inconspicuous, solitary, or in racemes, corymbs or panicles. Reasoner Bros., Oneco, Fla., introduced *D. remotiflora* and *D. divia*, Switch Sorrel, from Australia, in 1889. These names are not found in Index Kewensis.

DOGBANE is *Apocynum.*

DOG'S-TAIL GRASS. *Eleusine Indica.*

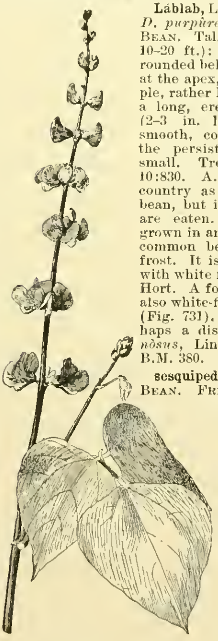
DOGTOOTH VIOLET. See *Erythronium.*

DOGWOOD. *Cornus*, especially *Cornus Mas.*

DÒLICHOS (old Greek name). *Leguminòsæ.* Differs from Phaseolus in technical characters: keel of the corolla narrow and bent inwards at a right angle, but not distinctly coiled; style bearded under the stigma, which is terminal; stipules small. Tropical twining beans of perhaps 40–50 species, of which a few forms are in cult. in this country. *D. Japonicus*, a most worthy ornamental vine, will be found under *Pueraria.* For the Velvet or Banana Bean, *D. multiflorus*, see *Mucuna.* For *D. unguiculatus*, see *Vigna.*

Láblab, Linn. (*D. cultràtus*, Thunb. *D. purpùreus*, Lindl.). HYACINTH BEAN. Tall-twining (often reaching 10–20 ft.): leaflets broad-ovate, rounded below and cuspidate-pointed at the apex, often crinkly: fls. purple, rather large, 2–4 at the nodes, in a long, erect raceme: pods small (2–3 in. long) and flat, usually smooth, conspicuously tipped with the persistent style; seed black, small. Tropics. B. M. 896. B. R. 10:830. A. G. 14:84.—Cult. in this country as an ornamental climbing bean, but in the tropics the seeds are eaten. Annual. It is easily grown in any good garden soil. Like common beans, it will not endure frost. It is very variable. A form with white fls. and seeds is *D. albus*, Hort. A form of very large growth, also white-fld., is *D. gigantèus*, Hort. (Fig. 731). A perennial form (perhaps a distinct species) is *D. lignòsus*, Linn., the Australian Pea. B.M. 380.

sesquipedàlis, Linn. ASPARAGUS BEAN. FRENCH YARD-LONG. TAU-KOK. Fig. 194. Long-rambling or twining annual plant, with deltoid-ovate or deltoid-oblong blunt-pointed leaflets: fls. rather large, 1–3 in the axils, the peduncles elongating and bearing the pods at their summits: pods compressed or nearly terete, slender and very long (often 2 ft.) and sometimes curiously twisted; seeds small, oblong, more or less truncate or squared at the ends, usually reddish or dim-colored. S. Amer.—Cult. as a vegetable garden esculent, the green pods and dry beans being eaten. As easily grown as other beans. L. H. B.



731. Dolichos Lablab (form giganteus). (× 1/3.)

DÓMBEYA (after Joseph Dombey, (1742–1793), French botanist and companion of Ruiz and Pavon in Peru and Chile). *Sterculiàceæ.* About 24 species of shrubs or small trees of minor importance from Africa or Madagascar: lvs. often cordate, palmately nerved: fls. rosy or white, numerous, in loose axillary or terminal cymes or crowded into dense heads; calyx 5-parted, persistent; petals 5; stamens 15–20, 5 sterile, the rest shorter: ovary 3-5-celled.

Natalénsis, Sond. Distinguished by its cordate, acute lvs. and the narrowly awl-shaped leaflets of the involucre. Lvs. long, petioled, somewhat angular, toothed, with minute stellate pubescence, 5–7-ribbed: umbels 4–8-fld. Natal.—Cult. in S. Fla. and north under glass. "Very rapid growing, foliage poplar-like: fls. pure white, large, sweet-scented; a very good winter blooming plant."—*Franceschi.*

D. acutángula, Cav. Height 9 ft.: lvs. glabrous, heart-shaped, long-acuminate, serrate, deeply 3–5-lobed or cleft: fls. few, large, pink, in compact, forking corymbs. Mauritius. B.M. 2905 shows a form with entire lvs.—*D. Búrgessiæ*, Gerrard. Lvs. pubescent, cordate, but with 2 deep, wide cuts, and 2 shallow ones besides the basal one: fls. numerous, large, white, rosy at center and along veins; petals rounded. S. Africa. B.M. 5487. —*D. Mastersii*, Hook. Shrub, 4–5 ft. high: lvs. velvety, heart-shaped, serrate: fls. fragrant, white, with thinner veins of rose than in D. Burgessiæ; petals acute. Trop. Afr. B.M. 5639.—*D. viburniflòra*, Boj., has very numerous white fls. with narrower petals than any here described: lvs. cordate, 3-lobed, the cuts not as wide as in D. Burgessiæ. Comoro. B.M. 4568.

DOÒDIA (after Samuel Doody). *Polypodiàceæ.* A small genus of greenhouse ferns from Ceylon, Malaya and New Zealand. Sori curved, placed in one or more rows between the midribs and the margins of the pinnæ.

A. *Lvs. pinnatifid.*

áspera, R. Br. Lvs. 6–18 in. long, 2–4 in. wide, pinnatifid, the lower pinnæ gradually becoming smaller: sori in 1 or 2 rows. Australia. Crested varieties occur in cultivation.

AA. *Lvs. pinnate in the lower half.*

mèdia, R. Br. Lvs. 12–18 in. long, with pinnæ 1–2 in. long, the lower ones gradually smaller. Australia and New Zealand. *D. Kunthiàna*, Gaud., from the Hawaiian Islands, has close central pinnæ. *D. supérba*, Hort., is a larger garden form.

caudàta, R. Br. Lvs. 6–12 in. long, with pinnæ about an inch long, the spore-bearing ones shorter; apex often terminating in a long point. Australia and New Zealand.

L. M. UNDERWOOD.

According to Schneider's Book of Choice Ferns, all Doodias, except *D. blechnoides*, are of dwarf habit, and are useful for fern-cases and for edgings of window boxes, especially for northern aspects, where flowering plants do not prosper. Cool and intermediate temperatures are best. They are excellent for forming an undergrowth in cool houses, as they are seldom infested with insects, endure fumigation, and do not care whether their taller neighbors are syringed or not. Schneider recommends 3 parts of peat and one of silver sand. Loam does not help, but a little chopped sphagnum does. They are very sensitive to stagnant water, and do not like full exposure to sunlight. Always prop. by spores, but division is possible.

In the American Florist 12:142, "A.H." writes: "*D. aspera* and its crested variety are most useful, but they can hardly be recommended as market ferns. They require similar treatment to the Blechnums, and are seen at their best in a 4-inch pot. The young fronds have a very bright tint, which livens up the more somber hue of the older fronds. They lose the bright tint much more quickly when allowed to get too dry. Being of slender growth, care should be taken not to over-pot. They like plenty of leaf-mold and peat in the compost, and good drainage."

DOOR-WEED. *Polygonum aviculare.*

DORÓNICUM (Latinized Arabic name). *Compósitæ.* LEOPARD'S BANE. Hardy herbaceous plants, 1–2 ft. high, with yellow flowers, mostly one on a stem and 2–3 in. across, borne high above the basal crown of foliage, from April to June. From 10–24 species, natives of Europe and temperate Asia. Stems little branched or not at all: lvs. alternate, radical ones long-stalked, stem-lvs. distant, often clasping the stem. The genus is allied to Arnica, and distinguished by the alternate lvs. and by the style. The plants are of easy culture in rich loam. The flowers are numerous and good for cutting. Doronicums have been strongly recommended for forcing.

A. *Root-lvs. not notched at the base, ovate.*

plantagíneum, Linn. Glabrous, but woolly at the neck, with long, silky hairs: root-lvs. ovate or oval, wavy-toothed: stem-lvs. nearly entire, the lower ones narrowed into a petiole and not eared, the upper ones sessile, oblong, acuminate. Sandy woods of Eu. Rhizome tuberous, roundish, or creeping obliquely. Stalk of the root-lvs. about 3 in. long. Typically about 2 ft. high. G.C. III. 17:229. Var. **excélsum**, Hort. (*D. excélsum*, Hort. *D.* "*Harpur Crewe*," Hort.), is more robust, grows about 5 ft. high and is probably more cult. than any other kind of Doronicum. Fls. sometimes 4 in. across. Gn. 47, p. 269, and 28:518. G.C. II. 20:297.

Clùsii, Tausch. Lvs. ovate or oblong; stem-lvs. half clasping, with distant teeth or many small ones. One subvariety has long, silky hairs on its lvs., while another has none. Swiss and Austrian Alps.—"Soft, downy foliage," J. W. Manning. "Grows 2 ft. high," Woolson. "Larger and later fls. than *D. Caucasicum*," Ellwanger and Barry.

AA. *Root-lvs. notched at the base, heart-shaped.*

B. *Root tuberous.*

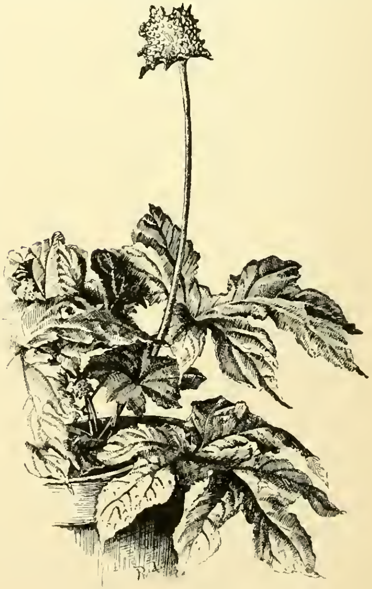
Pardaliánches, Linn. Hairy: lvs. toothed; lower stem-lvs. eared at the base of the stalk, sub-ovate, upper ones spatulate-cordate, highest ones cordate-clasping, acute. Woods of lower mts. of Eu.—While all species are typically 1-fld., any of them may have now and then more than 1 fl. on a stem, and this species particularly may have 1–5 fls.

BB. *Root not tuberous.*

Caucásicum, Bieb. Glabrous except as noted above: lvs. crenate-dentate, lower stem-lvs. eared at the base of the stalk, the blade subcordate, highest ones cordate to half-clasping. Shady woods of Caucasus, Sicily, etc. B.M. 3143, which shows stems with 1 fl. and 1 lf.—Fls. 2 in. across.

Austriacum, Jacq. A trifle hairy: lvs. minutely toothed, lower stem-lvs. spatulate-ovate, abruptly narrowed at the base, half-clasping, highest ones cordate-clasping, lanceolate. Subalpine woods, Eu.

W. M.



732. Dorstenia Contrajerva (×¼).

DORSTÈNIA (an early German botanist, Theodor Dorsten). *Urticàceæ* (or *Moràceæ*). Between 40 and 50 tropical herbs, remarkable for the dilated receptacle in which the unisexual fls. are borne. The plants are not in the Amer. trade, but they are often grown in botanical establishments to illustrate morphology. The fig is a hollow receptacle; the Dorstenia bears a flattened or cup-like receptacle, and is an intermediate stage between the fig and other plants. One of the common species is *D. Contrajérva*, Linn. (Fig. 732), which is native to trop. Amer. Both staminate and pistillate fls. are without perianth; stamens 1 or 2: ovary 1-loculed; stigma 2-lobed. Dorstenias are easily grown in warm, shady glasshouses.

L. H. B.

DORYÁNTHES (Greek, *spear-flower;* the flowering stem 8–25 ft. high, crowned by a spike of fls. 3 ft. high). *Amaryllidàceæ.* A genus of 4 species of gigantic desert plants from Australia, with 100 or more lvs. 6 ft. long when full grown. Franceschi, Santa Barbara, Calif., writes, "They are impressive plants for large conservatories, or for open ground in the South, where they will stand slight frosts." They belong to the same family with the Century Plants, and are the only ones in the tribe outside of America. The roots are fibrous and clustered. The ovules and seeds, though inserted in two series, are so placed above one another as to form one row in each cell. The lvs. have a curious brown tubular tip, which is especially long in *D. Palmeri.* Franceschi says, "*D. Guilfoylei* and *D. Larkini*, recently described from Queensland, are yet to be introduced to this country." A plant of *D. Palmeri* remained at Kew 16 years before flowering. Plants of Doryanthes are prop. by suckers, which are produced only after flowering. The process is very slow. The young plants must be repotted for several years until they have attained a large size. They are said to do best in a compost of loam and leaf-mold in equal parts.

A. *Lvs. not ribbed.*

excélsa, Correa. Lvs. sword-shaped, smooth, entire, with a very narrow cartilaginous margin, lower ones recurved, others erect: scape clothed with lanceolate lvs., which sheath the stem at their base: fls. in a globular head, deep crimson or maroon inside and out. B.M. 1685. R.H. 1865, pp. 466, 471; 1891, p. 548. G.C. II. 11:339.

AA. *Lvs. slightly ribbed.*

Pálmeri, W. Hill. Even more gigantic than *D. excelsa*, lvs. longer and broader, and a longer brown point: fls. in a thyrsoid panicle, bright scarlet outside, whitish within. B.M. 6665. F.S. 20:2097. R.H. 1891:548. G.C. II. 17:409.—"This has been flowering and fruiting several times in southern California."—*Franceschi.*

W. M.

DORYÓPTERIS (Greek, *lance-fern*). *Polypodiàceæ.* A genus of small sagittate or pedate greenhouse ferns, with continuous marginal sori and copiously anastomosing veins. Sometimes joined to Pteris, which see for culture. Not to be confused with Dryopteris.

palmàta, J. Sm. Lvs. 4–9 in. each way, with 5 or more triangular lobes or the fertile still more divided; ribs black. West Indies to Brazil.

nóbilis, J. Sm. Larger: lvs. sometimes 1 ft. long, pedately bipinnatifid; ribs chestnut. South Brazil.

D. decípiens, with lvs. resembling a geranium leaf, 3–6 in. each way, is sometimes cultivated, as is *D. decora*, with more divided lvs. Both are natives of the Hawaiian Islands.

L. M. Underwood.

DOSSÍNIA (E. P. Dossin, Belgian botanist, 1777–1852). *Orchidàceæ.* A genus of 2 species of terrestrial orchids, allied to Anœctochilus, but lacking the bearded fringe on the lower part of the labellum. The species described below may possibly be cult. by a few amateurs who are skilled in the cultivation of dwarf warmhouse foliage plants.

D. marmoràta, C. Morr. (Anœctochilus Lowei, Hort.). Lvs. golden-veined or marbled, 4–5 in. long, elliptic: scape pubescent, 10 in. high: spike 5 in. long, with many white, pubescent fls. Java. F.S. 4:370.—There is a stronger-growing var., with foliage better colored.

DOUGLÁSIA (after David Douglas, the tireless Scotch botanist, who explored California, Oregon and British Columbia in 1823 and 1829, introduced many splendid plants to cultivation, and perished in the Hawaiian Islands, at the age of 34, by falling into a pitfall made for wild animals). *Primulàceæ.* Five species of tiny primrose-like plants, one of which has yellow fls. and dwells in the mountains of middle Europe; the rest have rosy purple fls. and are found in the Rocky mountains and the shores of the Arctic ocean. The genus is closely allied to Androsace and Primula, but in those two genera all the lvs. come from the root, while Douglasia has branches, though very short ones, which are densely clothed with lvs. Douglasia has a corolla-tube longer than the calyx, and the capsule is 1–2-seeded. Androsace has a corolla tube as long as or shorter than the calyx, and its capsule may have few or many seeds. Primula is usually long-tubed, always many-seeded. The secret in the culture of alpine plants is a steady supply of moisture. "Like all the hardy Primulaceæ," writes J. B. Keller, "Douglasia requires half shade and a certain amount of moisture during the hot summer months. Frequent and copious waterings must be administered. A light mulch will assist in keeping the ground from drying out too fast. A winter protection of evergreen boughs is indispensable. The plants are prop. by division or by seed." Some of the American species can be obtained of foreign dealers.

Vitaliàna, Benth. and Hook. (*Arètia Vitaliàna*, Willd. *Gregòria Vitaliàna*, Duby). Height 2 in.: stems numerous, prostrate, somewhat woody: branches denuded of lvs. at the base, but at the tips clothed with overlapping, linear, entire, pilose lvs.: fls. nearly stalkless, solitary, yellow, rather large; corolla tube 2 or 3 times longer than the calyx, not dilated at the throat, the lobes ovate-lanceolate, obtuse. Alps, Pyrenees.

DOUGLAS SPRUCE. *Pseudotsuga Douglasii.*

DOWNING, ANDREW JACKSON (Plate II), the first great landscape gardener of America, was born at Newburg, N. Y., Oct. 30, 1815, and perished by drowning July 28, 1852, at the early age of 37. As a boy, he was quiet, sensitive, and much alone with himself and nature. The Catskills, the Hudson, and his father's nursery had much to do with his development. His "Treatise on the Theory and Practice of Landscape Gardening," published 1841, when he was but 26 years old, is, in many respects, a unique production. It was the first, and is to-day one of the best American books on the subject, and has exerted a greater influence upon American horticulture, it is said, than any other volume. "Cottage Residences," 1841, also had great popularity. In 1845 appeared simultaneously in London and New York the first edition of "Fruits and Fruit Trees of America," and in 1846 he founded, at Albany, "The Horticulturist," which he edited from his home at Newburg until his untimely death. His editorials in this excellent periodical (now represented in succession by American Gardening) were republished after his death, with a letter to his friends by Frederika Bremer, and a memoir by George William Curtis, under the title of "Rural Essays." It was not until 1850 that he had an opportunity to visit the great estates of England, and to see with his own eyes the landscape gardening of Europe. On his return in 1851, he was engaged to lay out the grounds near the Capitol, White House, and Smithsonian Institution at Washington. On July 28, 1852, he left Newburg on the steamer Henry Clay for New York. The Clay took fire near Yonkers, while it was racing, and Downing's life was lost in an attempt to save others. It would be difficult to overestimate the influence of Downing. He created American landscape gardening. His only predecessor, André Parmentier, is little known, and his influence was not of a national character. Downing's quickening influence affected country life in its every aspect. He stood for the simple, natural, and permanent as opposed to the intricate, artificial, and ephemeral. He was the first great American practitioner of what is known in polite and technical literature as the English or natural school of landscape gardening in distinction from all artificial schools, as the Italian and Dutch. Downing's pupils are many, and his spirit still lives. He gave inspiration to Frederick Law Olmsted, our next great genius in landscape gardening, who, by his early work in Central Park, New York, aroused that popular enthusiasm which has culminated in the American idea of great municipal park systems, as opposed to the earlier Old World idea of exclusive pleasure grounds and private parks. Downing's books have had large sales, and have gone through many editions. His intellectual successor in his purely pomological work was his brother Charles, whose modest labors in the revision of the Fruits and Fruit Trees of America have brought him little popular fame, but much sincere admiration from students. Most horticultural writings are, in reality, only records of progress; they do not create progress. Few of our horticultural books are epoch-making. Downing's writings, however, started a great popular movement in America toward beautiful homes and home grounds. By many persons, Andrew Jackson Downing is considered the greatest single figure in the history of American horticulture, and one of the few persons who can be said to have had real genius. An appreciation of Downing's personality will be found in Frederika Bremer's "Homes of the New World." (See *Downingia*, for the genus of plants named after him.) W. M.

DOWNING, CHARLES (Plate II), distinguished pomologist and elder brother of Andrew Jackson Downing, the landscape gardener, was born at Newburg, N. Y., July 9, 1802. He was educated at the local academy, and from the age of 13 to 18 worked part of the time in his father's nursery. At the age of 20 he started in the nursery business on his own account. From 1834 to 1839 his brother Andrew was a partner in this business. About 1850, he sold out his nursery business and devoted himself to the study of varieties of fruits, on which subject he was the leading authority until his death. The Fruits and Fruit Trees of America is the monumental American work on varieties of fruits. The book was projected by Andrew, but the great bulk of the work was done by Charles in continuing and revising it. His test orchard contained trees and grafts of 1,800 varieties of apples, 1,000 pears, and other fruits in proportion. In 1869 a city street was put through it. Charles Downing was very modest and retiring. He would never make a public speech, but he wrote many pomological articles over the signature "C. D." All his work is marked by conscientious accuracy. He was married, but, like his brother, had no children. He died Jan. 18, 1885. W. M.

DOWNÍNGIA (after Andrew Jackson Downing, of whom a sketch is given above). *Lobeliàceæ.* Three species of annual herbs, 2 from western America, 1 from Chile, much branched, diffuse, with pretty and characteristic fls. Lvs. alternate, entire, passing above into bracts: fls. blue or violet, marked with yellow and white; corolla 2-lipped, the upper lobes much narrower than the 3 lower ones; tube of stamens free from the corolla: seeds numerous, small, oblong to spindle-shaped. This genus has no near allies of much garden value. It is still known to the trade as Clintonia. David Douglas (see *Douglasia*) named it after DeWitt Clinton in 1829, but in 1818 a genus of the lily family had been named after the celebrated Governor of New York and projector of the Erie canal.

In 1836 Lindley wrote, in the Botanical Register, of *C. pulchella*: "I figure this little plant more for the sake of recording its existence than from any expectation that it will ever become an object of horticultural interest, for since *C. elegans*, a far hardier and more cultivable plant, has disappeared, there can be little hope that this, beautiful as it is, will be preserved." Nevertheless, pulchella is still cultivated, while elegans is unknown to the American trade. In Lindley's time, pulchella was grown in a flower pot and treated as a tender plant. Nowadays it is considered perfectly hardy, the seed being sown in the open ground. The credit of simplifying the culture of this plant is given to Haage & Schmidt, Erfurt, Germany, who have fixed varieties that are chiefly blue and chiefly violet, though in each case the 3 lower lobes of the corolla have a 3-lobed spot of white in the middle, and a 3-lobed spot of yellow at the base. The plants grow about 6 in. high, and have been recommended for edgings. For culture, see *Annuals*.

A. *Fls. large, with a 3-lobed spot of yellow: lvs. obtuse, narrow.*

pulchélla, Torr. (*Clintònia pulchélla*, Lindl.). The lower lip more dilated and more deeply 3-lobed. The 2 divisions of the upper lip ovate-lanceolate or oblong and strongly diverging. Calif. B.R. 22:1909. R.H. 1861:171. R.H. 1895, p. 19, shows its straggling habit as a pot-plant. Many of the branches fall below the top of the pot.

AA. *Fls. half as large as the above, and no yellow spot: lvs. acute, broader.*

élegans, Torr. (*C. élegans*, Doug.). Lvs. ovate to lanceolate; the broad lip moderately 3-lobed; the 2 divisions of the smaller lip lanceolate, parallel; lower lip with a white, but no yellow spot. Calif. B.R. 15:1241. W. M.

DRÀBA (Greek, *acrid*, from the taste of the lvs.). *Cruciferæ.* WHITLOW GRASS. One of the most important groups of spring-flowering plants for the alpine garden. It is a large and widely scattered genus of tufted, hardy herbs, with stellate hairs: lvs. often in a rosette, mostly uncut: scapes or stems leafy or not: racemes short or long: fls. without bracts, small, white, yellow, rosy or purple.

Drabas are very pretty, dwarf, compact alpine plants, with small but numerous fls.; admirably adapted for the rockery or front part of a sunny border. They require a sunny position and an open soil. It is important that they be well matured by the autumn sun. The plant forms a dense little rosette of lvs., and has a neat appearance at all times. In spring, Drabas are thickly covered with their little fls., and when planted in masses are decidedly effective. Prop. chiefly by division; also by seed, which may be sown in the fall if desired. Cult. by J. B. KELLER.

Of the species described below, only the first, second, fourth and sixth are advertised in Amer. at present. The rest are worth introduction, and can be procured abroad under their names or synonyms.

A. *Flowers yellow.*

B. *Lvs. rigid, keeled, ciliate.*

C. *Scape not hairy.*

D. *Style as long as the pod is wide.*

aizoìdes, Linn. About 2–3 in. high: lvs. lanceolate-linear: stamens nearly as long as the petals. March. Eu. B.M. 170.

DD. *Style half as long as the pod is wide.*

Aìzoon, Wahl. About 3 in. high: lvs. linear. April. Europe.

CC. *Scape hairy (villous or pubescent).*

D. *Pod lanceolate, bristly.*

cuspidàta, Bieb. Lvs. linear: style a little shorter than the pod. Asia Minor.

DD. *Pod oval, pubescent.*

Olýmpica, Sibth. (*D. bruniæfòlia*, Stev.). About 4 in. high: lvs. linear, a trifle keeled: petals twice as long as the calyx and stamens: style very short. June. Greece, Orient.

BB. *Lvs. not rigid or keeled.*

C. *Scape not hairy.*

híspida, Willd. (*D. tridentàta*, DC.). About 3 in. high: lvs. obovate, narrowed into a long petiole, obscurely 3-toothed at the apex, somewhat bristly: pods oblong, not hairy. Scotland, Caucasus.

CC. *Scape more or less hairy.*

D. *Hairs long, soft and slender, i.e., pilose.*

alpìna, Linn. Lvs. lanceolate, flat: pods oblong: style very short. April. Arctic regions.

DD. *Hairs short, soft and downy, i.e., pubescent.*

aùrea, Vahl. Doubtfully perennial or biennial: lvs. ovate-lanceolate, entire or remotely serrate: pods oblong-lanceolate. Arctic regions. B.M. 2934.

AA. *Flowers white.*

B. *Plants biennial or annual.*

cinèrea, Adams. Lvs. oblong-linear: pods oblong, pubescent, shorter than the pedicel. Early spring. Siberia. —Closely related to *D. confusa*, but has a looser, weaker, less leafy stem, the stem-lvs. 5–6, scattered, entire.

BB. *Plants perennial.*

C. *Leaves rigid.*

Máwii, Hook. Forming low, densely tufted, bright green patches: stem much branched, densely clothed with spreading, rosulate lvs.: lvs. linear-oblong, obtuse, bristly, with a prominent midrib below: scape very short, woolly, 2-4-fld., very short-pedicelled: petals thrice as large as the sepals, obcordate, white: pods ellipsoid, compressed. Spain. B.M. 6186.

CC. *Lvs. not rigid.*

Fladnizénsis, Wulf (*D. nivàlis*, DC. *D. Lappónica*, Willd.). Lvs. oblong-linear to lanceolate, ciliate: pods elliptic-oblong to ovate-lanceolate, not hairy. Arctic regions.—According to De Candolle, these three names were distinct species.

AAA. *Fls. rose or purple.*

Pyrenàica, Linn. Height 2-3 in.: lvs. inversely wedge shaped, 3-lobed at apex: fls. white at first, changing to rosy pink. May. Pyrenees. B.M. 713.—Said to be easily prop. by cuttings.

violàcea, DC. Lvs. obovate-oblong, obtuse, equally woolly on both sides: scapes leafy: petals obovate, dark purple. Andes of Equador at elevations of 13,000-15,000 ft. B.M. 5650.

W. M.

DRACÆNA (*female dragon;* the dried juice supposed to resemble dragon's blood). *Liliàceæ.* A genus of tropical plants of which but few are in cultivation. They are all woody, often arborescent, with sword-shaped or broad lvs., mostly crowded at the summit of the stem: fls. clustered in panicles or heads, greenish white or yellowish; perianth salver-form or companulate; lobes spreading; stamens 6: fr. a 3-celled berry. Differs from Cordyline in having larger fls., and solitary instead of many ovules in each cell of the ovary. All ornamental stove plants, frequently with variegated lvs. See Baker, Journ. Linn. Soc., vol. 14, for a monograph of the genus. *Dracæna Draco*, of the Canaries, is the Dragon Tree. It reaches a height of 30-60 ft., branching when of great age. The Dragon Tree of Teneriffe, famous for centuries, is 70 ft. high, and one of the oldest of known trees.

Some American trade names not referable to species are: *alba-marginata*, *argenteo-striata*, *DeSmetiana*, *Elizabethiæ*, *Frederica*, *Hendersoni*, *imperator*, *Salmonea*, *Alexandria*, *recurva*, *spectabilis*. See *Cordyline* for other names not found in this article; also for culture. *D. Nova-Caledonica* is probably *Cordyline Neo-Caledonica*, Linden, with bronze lvs.

The following is a key to the cultivated species of both Dracæna and Cordyline, based upon the lvs.:

A. Lvs. long and sword-shaped, sessile.
  B. Glaucous beneath, 2-5 in. wide. *C. indivisa.*
  BB. Both faces similar, narrower.
    C. Of mature plants quite narrow (6-15 lines broad). *C. stricta.*
    CC. Of mature plants broader (1-2 in.).
      D. Margins green.
        Glaucous green, costate, 1½-2 ft. by 15-21 lines. *D. Draco.*
        Green, costate, undulate below, 2-3½ ft. by 1½-2 in. *D. umbraculifera.*
        Green, costa obscure, 3-4 ft. by 13-18 lines. *C. australis.*
      DD. Margins white-pellucid. *D. Hookeriana.*
AA. Lvs. oblanceolate, broadly petioled or sessile.
  B. 3-4 in. by 1½-2 in., opposite or whorled. *D. Godseffiana.*
  BB. 12-15 in. by 18-21 lines, alternate. *C. rubra.*
  BBB. 1½-3 ft. by 2½-4 in., alternate. *D. fragrans.*
AAA. Lvs. ovate, lanceolate, or elliptical, petioles narrow.
  Lvs. 4-8 in. by 2-2½ in., oblong-falcate, green. *C. Haageana.*
  Lvs. 7-8 in. by 4-5 in., oblong, white-spotted. *D. Goldieana.*
  Lvs. 7-10 in. by ½-1½ in., lanceolate, white-margined. *D. Sanderiana.*
  Lvs. 10-18 in. by 1-3½ in., elliptical. *C. terminalis.*

The following Dracænas are in the American trade: Boerhavii, 1; Draco, 1; fragrans, 4; Godseffiana, 7; Goldieana, 5; Hookeriana, 3; Knerkii, 4; latifolia, 3; Lindeni, 4; Massangeana, 4; Rothiana, 4; Sanderiana, 6; umbraculifera, 2.

1. **Dràco**, Linn. DRAGON TREE. Arborescent (60 ft. high), branched: lvs. very numerous, crowded, sword-shaped, erect or the outer recurved (1½-2 ft. x 15-21 in.), scarcely narrowed below, long-attenuate at the apex, glaucous-green: pedicels 3-6 lines long: bracts minute, lanceolate: perianth 4 lines long, greenish; filaments flat: berries orange. Canary Isl. B.M. 4571. R.H. 1869, p. 416; 1880, p. 196. G.C. II. 14:749.—Fine for conservatory. **D. Boerhavii**, Tenore, is a garden form, with elongated lvs. all recurved.

2. **umbraculifera**, Jacq. Arborescent (3-10 ft. high), simple: lvs. very numerous, crowded, sword-shaped (2-3½ ft. x 1½-2 in.), outer recurved, all green and shining, attenuate at the apex, scarcely narrowed toward the conspicuously undulate base, costa distinct on both faces: pedicels 4-6 in. long: bracts minute, deltoid: perianth large, 2 in. long, white, tinged with red; filaments filiform. Mauritius. L.B.C. 3:289.

3. **Hookeriàna**, Koch. Trunk 3-6 ft. high, sometimes branched: lvs. numerous, densely clustered, sword-shaped (2-2½ ft. x 1½-2 in.), outer reflexed, all long attenuate at the apex, scarcely narrowed below, margin white-pellucid, lower face concave, indistinctly costate beneath: bracts 1½-3 in. long, white: pedicels 3-4 in. long; perianth greenish, 12-15 in. long; filaments filiform: berries orange. Cape Good Hope. **D. latifòlia**, Regel, is a horticultural variety, with lvs. 3-3½ in. wide. G.C. 20:305 (var. *latifòlia*). B.M. 4279 as *Cordyline Rumphii.*

4. **fràgrans**, Ker-Gawl. (*Aletris fràgrans*, Linn. *Sansevièra fràgrans*, Jacq.). Arborescent (20 ft. high or more), sometimes branched: lvs. (1½-3 ft. x 2½-4 in.), sessile, oblanceolate, lax and spreading or recurved, flaccid, green and shining, acute, indistinctly costate: bracts minute, scarious, deltoid: pedicels 1-1½ in. long: fls. glomerate; perianth 6-8 in. long, yellow: berry orange-red. Guinea. B.M. 1081. A.G. 18:389. F.R. 4:189.—Much used for greenhouse and table decoration. **D. Knérkii**, Hort. Form with glossy light green, less pendulous lvs. **D. Rothiàna**, Hort. A garden form. I.H. 43, p. 97. R.H. 1877, p. 68. Var. **Líndeni**, Hort. (*D. Líndeni*, Hort.). Fig. 733. Lvs. recurved, traversed from base to apex by creamy white bands. Very decorative. I.H. 27:384. F.R. 4:191. Var. **Massangeàna**, Hort. (*D. Massangeàna*, Hort.). A broad, yellow stripe along the center of the leaf throughout its entire length F.R. 4:193.

733. Dracæna fragrans, var, Lindeni.

5. **Goldieàna,** Hort. Trunk simple, slender: lvs. distant, spreading, thick-oblong (7–8 in. x 4–5 in.), cuspidately pointed, base broadly rounded or cordate, glossy green, conspicuously white-spotted and banded, young lvs. often tinged with red; petioles erect (2–3 in. long), deeply grooved: fls. unknown (?). W. Trop. Afr. B.M. 6630. R.H. 1878, p. 15. I.H. 25:300; 42, p. 257. G.C. II. 17:49.—A fine foliage plant.

6. **Sanderiàna,** Hort. (*D. thaloìdes*, var. *variegàta*, Hort. ?). Slender: lvs. distant, alternate, spreading or recurved (7–10 in. x ½–1½ in.), narrowly lanceolate, acuminate, on rather broad petioles (1–3 in. long), glossy-green, broadly margined with white. Congo. A.F. 8: 1281; 11:235. I.H. 40:175. G.C. III. 13:445.—Int. by Sander & Co. in 1893.

7. **Godseffiàna,** Hort. Woody, but very slender, rather diffuse: lvs. at many nodes small, erect, scale-like and lanceolate, the others opposite or in whorls of 3, oblong or obovate, spreading, cuspidate, sessile (3–4 in. x 1½–2 in.), firm, green, with copious white spots: raceme short-peduncled; bracts small: fr. globular, greenish yellow or red, nearly 1 in. in diam. Congo. G.C. III. 21:347. Gn. 50, p. 276; 51:1115, and p. 299. A.F. 13:1340. F.E. 10, supp. 2:12. Gng. 6:294.—Int. by Sander & Co. Fine for decorative purposes.

D. arbòrea, Link. Lvs. green, sword-shaped, dense, sessile. Gt. 46, p. 226 and 1438.—*D. Broòmfieldi*, Hort. J.H. III. 33:541. G.C. III. 20:667; 23:249.—*D. concinna*, Kunth. Lvs. oblanceolate, green, purple on the margin, green-petioled. Gt. 441:1864.—*D. cylíndrica*, Hook. Lvs. linear-lanceolate or obovate-lanceolate, bright green, spreading. B.M. 5846.—*D. ellíptica*, Thunb. Lvs. spreading, petioled, thickish, elliptic-lanceolate, glossy, acute, longitudinally striate. B.M. 4787 and G.C. II. 17:261 (var. maculata).—*D. Eèckhanti*, Hort. F.R. 446:1899.—*D. ensifòlia*, Hort. Amer. =Dianella ensifolia.—*D. marginàta*, Lam. Lvs. sword-shaped, dense, spreading, green margined and veined with red.—*D. marmoràta*, Hort. B.M. 7078.—*D. phrynioìdes*, Hook. Lvs. petioled, mostly oval, acuminate, coriaceous, spotted with yellowish white, pale beneath. B.M. 5352.—*D. refléxa*, Lam. Lvs. lanceolate or sword-shaped, acute, contracted into a petiole.—*D. Saposchníkowi*, Regel. Lvs. sword-shaped, crowded, green. Gt. 705.—*D. Smíthii*, Baker. Lvs. large, narrowly sword-shaped, crowded bright green. B.M. 6169.

K. M. WIEGAND.

Dracænas should be divided into two sections or types for practical purposes:

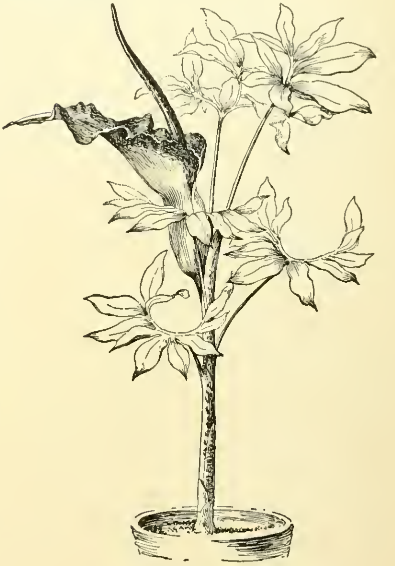
(1) The Tropical type: This includes the colored foliage sorts and the garden hybrids, all of which can be propagated from both root and stem-cuttings or joints. All of them require a stove or warmhouse temperature, and must be grown quick, and never allowed to get pot-bound until they are as large as required; then they can be allowed to get pot-bound, and with liquid or other stimulant and plenty of light will color well.

(2) The Cordyline or Subtropical or Australian type: This embraces the kinds known to gardeners as *australis*, *indivisa*, *lineata*, *sanguinea*, *aurea-striata*, *Doucetiana*, *umbraculifera*, *Rumphii*. Nearly all of these are propagated from seeds, and require a cooler temperature.

Following are some popular current Dracænas: *Sanderiana* makes not only a perfect center plant for table jardinieres with small ferns and selaginellas, but it also makes a fine large decorative plant by putting from 3–5 in a 4–5 in. pot, and letting them get fairly well pot-bound until each plant throws up shoots from the base; then repot, and one will have a fine, large specimen in a short time. *Godseffiana* is a valuable plant for a hanging basket, easily propagated from top shoots. Other popular kinds are: *Norwoodiensis*, *albo-marginata*, *terminalis alba*, *Gladstonei* (one of the most brilliantly colored of the broad-leaved type), *Guilfoylei*, *Anerleyensis*, *Scottii*, *hybrida*, *metallica*, *ferrea*, *De-Smetiana*, *Victoriæ-Reginæ*, *Sanderiana*, *Godseffiana*, *gracilis*.

H. A. SIEBRECHT.

DRACOCÉPHALUM (Greek, *dragon's head*, from the wide-open mouths of the flowers). *Labiàtæ*. This genus contains a few hardy herbaceous perennial plants of the mint family, of easy culture and of minor importance. The whorls of fls. are distant or crowded into spikes or heads, the colors blue or some shade of purple. The genus has altogether about 30 species, from Europe, especially the Mediterranean region; also Asia outside the tropics. All the species described below are erect, but some others are diffuse: uppermost lvs. like the lower ones or reduced to bracts. Very closely allied to Nepeta. Sandy loam, moderately rich, and a rather moist, partially shaded situation will suit these plants best. In a sunny, dry border they are never very showy; the fls. are of short duration, and are seldom at their best except in very moist seasons. Prop. by division or seeds.



734. Dracunculus vulgaris (× ⅙).

A. *Lvs. entire, not cut in any way.*

Ruyschiànum, Linn. Stems slightly pubescent: lvs. linear-lanceolate, glabrous: bracts ovate-lanceolate, entire; whorls in somewhat interrupted spikes: fls. 1 in. long, purplish blue or purple; anthers villous. Siberia. **Var. Japónicum,** Hort., has white fls. shaded with blue, and is a distinct improvement. G.C. II. 12:167.—According to Vilmorin, this species has been sold as *D. Altaiense* (see *D. grandiflorum*).

AA. *Lvs. deeply 3–5-cleft.*

Austrìacum, Linn., has the habit of the above, and belongs to the same subgenus Ruyschiana, but the lvs. are divided and more distinctly revolute at the margin. About 1–1½ ft. high: fls. blue, 1½ in. long and more. July, Aug. Eu., Caucasus.

AAA. *Lvs. cut only at the margin, mostly crenate.*

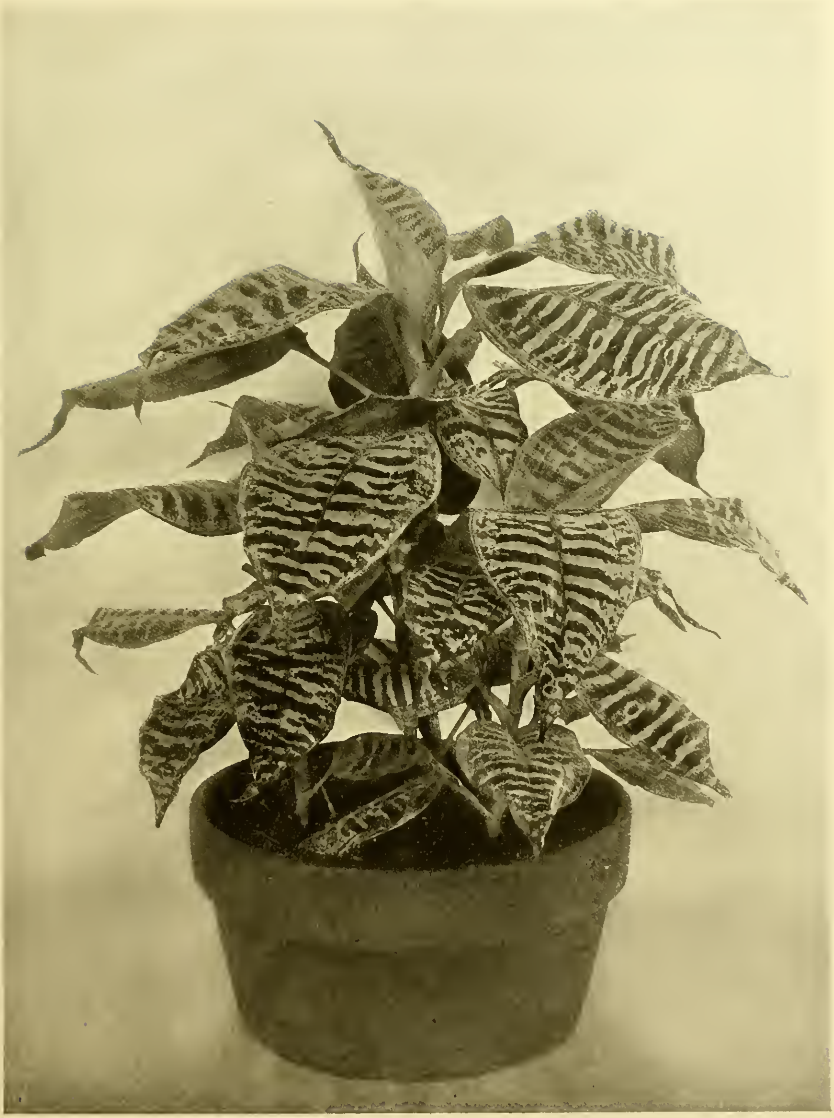
B. *Whorls crowded together into spikes or heads.*

C. *Color of fls. blue: lvs. not wrinkled.*

grandiflòrum, Linn. (*D. Altaiénse*, Laxm., but plants in trade under this name are said to be *D. Ruyschiana*). About 1 ft. high. Root-lvs. long-stalked, oblong, notches at base: stem-lvs. few, short-stalked, ovate, not notched at base, the uppermost still more rounded: whorls in spikes 2–3 in. long, the lowest whorl usually at some distance: fls. 2 in. long. June, July. Siberia. B.M. 1009. P.M. 13:51.

CC. *Color of fls. purple: lvs. wrinkled.*

speciòsum, Benth. Allied to *D. grandiflorum*, but stem pubescent instead of pilose above, root-lvs. more



Dracæna Goldieana, a "foliage plant" from tropical Africa

broadly heart-shaped, and all lvs. pubescent beneath instead of nearly glabrous: fls. purplish to deep purple. June, July. Himalayas. B.M. 6281.

B. *Whorls distant, in long racemes.*

C. *Flowers erect.*

Moldávicum, Linn. Lvs. lanceolate, inciso-crenate, the floral ones narrower and saw-toothed at the base. Eu., N. Asia.

Rùprechtii, Regel. Lvs. ovate-lanceolate, variously incised and toothed: fls. rosy purple or lilac, about 1 in. long, in axillary clusters. Turkestan. Gt. 1018.

CC. *Fls. somewhat nodding.*

nùtans, Linn. Lvs. ovate, crenate, the floral ones oblong-lanceolate and more nearly entire: fls. blue. May–July. N. Asia. Mn. 4:137. B.R. 10:841.—Var. **alpina,** Hort., is commoner.

D. Virginiànum, Linn. See Physostegia.—*D. Canadense* of Bridgeman's Catalogue is a misprint for D. Canariense=Cedronella triphylla.

J. B. KELLER and W. M.

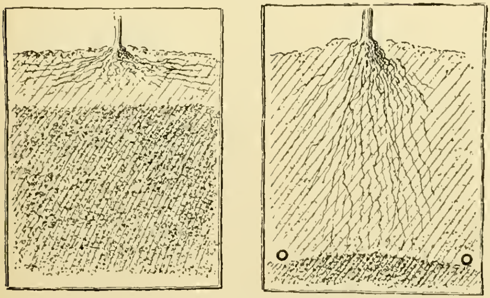
DRACÚNCULUS (Latin, *a little dragon*). *Aràceæ.* This genus contains the plant pictured in Fig. 734. It has uncanny, dragon-fingered lvs. and a terrifying odor when in flower. Its tubers are sold by bulb dealers under the name of *Arum Dracunculus.* The latest monographer of this order (Engler, in DC. Mon. Phan., vol. 2, 1879) puts this plant into the genus Dracunculus because the ovules are attached to the base of the ovary, while in Arum they are attached to the side. The lvs. of the true Arums are always arrow-shaped, while in Dracunculus they are sometimes cut into finger-like lobes. For culture, see *Arum.*

There are only 2 species. The common one is an entertaining, not to say exciting, plant. When it flowered in the forcing-houses at Cornell University, innocent visitors thought there must be a dead rat under the floor. It is well worth growing for the experience, though its stench is not quite as bad as that of a Helicosideros, sold as *Arum crinitum,* which makes any house unbearable in which it flowers. Nearly all Arums are ill-smelling.

vulgàris, Schott. Fig. 734. Sheath of lvs. livid, spotted: stalks green: blades with 10 fingers projecting from a bow-shaped base: tube of spathe streaked with purple except at the bottom: spathe purple all over and much darker along the wavy border. Mediterranean regions.

W. M.

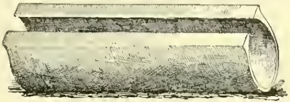
DRAGON PLANTS. The Dragon Arum, Dragon Root or Green Dragon, is the native *Arisæma Dracontium.* The Dragon Plant of Europe is *Dracunculus vulgaris.* The Dragon's Head is not an Aroid, but a Dracocephalum, a genus of mints. False Dragon's Head is Physostegia. The Dragon's Blood of commerce is a dark red, astringent, resinous secretion of the fruits of a palm, *Dæmonorops Draco.* Other kinds of Dragon's Blood are produced by *Dracæna Draco* and *Ecastaphyllum Monetaria.* "Sticks," "reeds," "tears" and "lumps" of Dragon's Blood are known to commerce. The resin is used in coloring varnishes, dyeing horn in imitation of tortoise shell, and n the composition of tooth-powders and various tinctures.



735. Diagrams showing the effect of lowering the water-table by means of under-draining.

On the undrained soil, the roots do not penetrate deep; and when droughts come, the plants suffer.

DRAINAGE. Underground or sub-drains serve to relieve the land of free water, which is harmful to most plants if left to stagnate in the surface soil or subsoil. They serve not only to dry the land in early spring, but indirectly to warm it, for if the water is removed the sun's heat warms the soil instead of cooling it by evaporating the surplus water. Tenacious lands devoted to gardening and small fruits are made more productive, warmer and earlier by sub-drainage. Drains promote nitrification, assist in liberating mineral plant-food and cheapen tillage. They serve not only to remove deleterious stagnant water, but they promote aëration as well, and this hastens beneficial chemical changes in the soil. Drainage promotes the vigor, healthfulness and fruitfulness of plants. Tenacious soils are made more friable by drains, thereby giving easier access to plant roots, while the percolation through the soil of rainwater, which carries some plant-food, is hastened. Rainwater in the spring is warmer than the soil; in midsummer it is cooler than the soil: therefore, percolation of rainwater warms the soil in the spring and cools it in extremely hot weather. Drains serve not only to relieve land of free water, but they impart to it power to hold additional available moisture, which materially benefits plants during droughts.

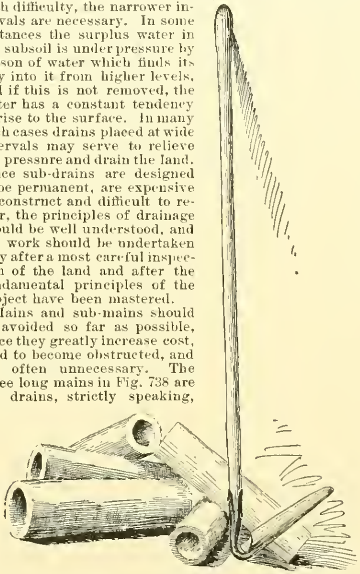


736. Old-fashioned drain tile.

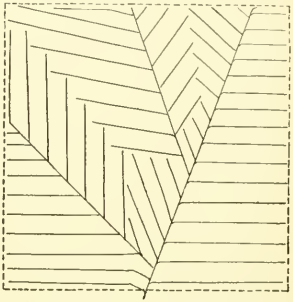
Drainage is of two kinds, surface and sub-drainage. On land on which large outlays of money are to be expended, as in horticultural plantations, it is of the utmost importance that the soil be freed to considerable depths from stagnant water. Trees, many shrubs, and even some garden crops send their roots deeper into the subsoil than most of the cereals, hence they require a greater depth of drained feeding ground. In horticulture the planting may often precede the harvest by 5 to 10 years, while with many farm crops the harvest follows the planting in a few months. If the grain raiser loses one crop, an annual, by planting on wet land, the loss is not great, but if the orchardist loses 15 to 20 years of labor by planting on undrained lands, before the mistake is discovered, the losses are serious. Some lands require little more than to be relieved from surplus surface water in early spring. This may be accomplished by forming ridges and open furrows as far asunder as the rows of trees are to be placed. But it is only rarely that surface drainage fully prevents serious damage from surplus moisture. Surface drainage may be considered a cheap way of temporarily alleviating undesirable conditions. It does not always eradicate them. Fig. 735 illustrates how sub-drainage lowers the water-table (or the area of standing water), and thereby ameliorates the soil.

Sub-drainage consists in placing conduits of tile or other material in the ground at depths varying from 2½–4 feet, and at such distances apart as will serve to relieve the subsoil of deleterious stagnant water. When suitable stones are at hand they are sometimes used instead of tile for forming drainage conduits. If such use is made of them, the drains should be somewhat deeper than tile drains, since the stones which form the drain occupy nearly a foot of the depth of the ditch and are more likely to become obstructed, especially if placed near the surface, than are tile drains. The throats or openings of stone drains are irregular in size, while those of tile drains are smooth and uniform in size, and are, therefore, most desirable. Years ago, various flat-bottomed tiles (Fig. 736) were used, but the only style in general use at present is the cylindrical unglazed tile shown in Fig. 737.

In some sections drains are placed 200 to 300 feet apart, and serve their purpose well. In others they should not be placed farther apart than from 20 to 30 feet. Wherever the subsoil is composed of tenacious, fine clay, through which the water moves upwards or downwards with difficulty, the narrower intervals are necessary. In some instances the surplus water in the subsoil is under pressure by reason of water which finds its way into it from higher levels, and if this is not removed, the water has a constant tendency to rise to the surface. In many such cases drains placed at wide intervals may serve to relieve the pressure and drain the land. Since sub-drains are designed to be permanent, are expensive to construct and difficult to repair, the principles of drainage should be well understood, and the work should be undertaken only after a most careful inspection of the land and after the fundamental principles of the subject have been mastered.



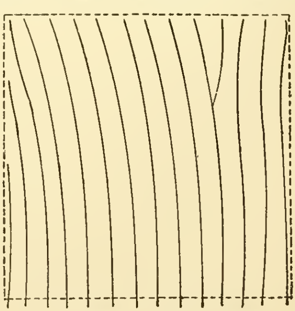
737. Common cylindrical drain-tile; and a scoop for preparing the bed for the tile.



738. Improper method of draining a field.

Mains and sub-mains should be avoided so far as possible, since they greatly increase cost, tend to become obstructed, and are often unnecessary. The three long mains in Fig. 738 are not drains, strictly speaking, since the land may be as fully drained without them, as shown in Fig. 739; therefore, they only serve to conduct the water of the drains proper. Tiles of 3 to 4 and 5 inches diameter should be used when the drains are infrequent and the flow of water considerable. Smaller ones, 2 to 3 inches in diameter, will suffice when the intervals between the drains are narrow. Drains should have as uniform a fall as possible, and no abrupt lateral curves or sharp angles should occur as are seen in many places in Fig. 738. If the drain has a rapid fall in its upper reaches, as is often the case, and but slight fall in the lower, a silt basin should be constructed at the point at which the rapid changes into the slight fall, if obstructing silt is present. All drains which may be necessary should be placed before the planting occurs. Orchard lands may be drained in the spring, fallowed in the summer, and planted in the fall or the following spring. Drains placed at frequent intervals because of the tenacity of the soil should be comparatively shallow, for if placed deep or at wide intervals, the water will be too long reaching them. If drains are placed at wide intervals they should be at least 3½ feet deep to be most efficient. If the parallel system is adopted (Fig. 739), there may be more outlets to construct and maintain than is desirable; if so, the system might be modified by constructing a sub-main, one side of which will serve also as a drain, and but one outlet will be required (Fig. 740). Drains through which water runs for the greater part of the year are likely to become obstructed by roots, if water-loving trees, such as the willow, soft maple and elm, are allowed to grow near them. If floating silt is present the joints of the tiles should be protected for two-thirds of their upper circumferences by a narrow strip of tarred building paper, or collars should be used. Stone drains should receive a liberal covering of straw before they are filled.
J. P. Roberts.

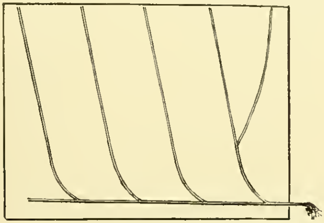
DREER, HENRY A. Seedsman, and founder of one of the oldest American horticultural establishments; was born in Philadelphia, Aug. 24, 1818, and died there Dec. 22, 1873, at the age of fifty-five. His parents were Frederick Dreer, of Hanover, and Fredericka Augusta Nolthenius, of Grossakenheim, Germany. They were married in America. The Nolthenius family emigrated to the United States in the last decade of the eighteenth century, and were closely connected with the Lutheran Church. Henry A. Dreer's education was largely in German, and obtained in Philadelphia. He was fond of gathering seeds and plants in the country, and would bring them home to cultivate. He was trained in his father's business, that of a cabinet-maker. In 1838, at the solicitation of a friend, he began as a florist in a small way, near Front and Chester Sts. About 1870 he removed to Seventh and Chestnut. In 1869 he enjoyed a 5 months' trip to Europe, where he met business correspondents of 30 years' standing. He was married June 22, 1847, to Mary Leavenworth, of Reading, Pa.,



739. Best method of draining a field.

and had six children. Of the two sons, one died in infancy, and the other, William F. Dreer, conducts, at 714 Chestnut street, the business which is incorporated in the name of his father. Henry A. Dreer died of a nervous affection of the heart. He was of modest temperament and frail constitution, and confined himself to business rather closely. He was liberal in public matters, but always kept out of political life. He compiled several small works in connection with the business, and wrote frequently for the Weekly Saturday Evening Post, of Philadelphia, and for Godey's Ladies' Magazine.

W. M.



740. Showing how the drains may be gathered into one when there is only one place at which an outlet can be secured.

DROPWORT. *Spiræa Filipendula;* also *Potentilla Filipendula.*

DRÓSERA (Greek, *dew;* referring to the dew-like drops on the glandular leaves). *Droseràceæ.* SUNDEW. DEW PLANT. A very interesting group of insectivorous plants. About 100 species scattered throughout the world, except the Pacific islands, and most common in Australia outside the tropics. Perennial bog herbs with basal lvs. clothed with glandular hairs, which secrete a fluid that holds insects fast. Foliage and inflorescence differ widely. The 3 species described below may be obtained through dealers in native plants. For culture, see *Darlingtonia.*

A. *Lvs. thread-like, with no distinct stalk: petals purple.*

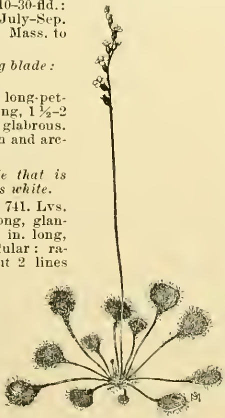
filifórmis, Rafin. Lvs. 6–15 in. long, glandular-pubescent throughout, at the very base woolly with brown hairs: racemes 1-sided, 10–30-fld.: fls. 4–12 lines broad. July–Sep. Wet sand near the coast. Mass. to Fla.

AA. *Lvs. with an oblong blade: petals white.*

longifòlia, Linn. Lvs. long-petioled; blade 8–15 lines long, 1½–2 lines wide, the petiole glabrous. Summer. Bogs, northern and arctic regions.

AAA. *Lvs. with a blade that is wider than long: petals white.*

rotundifòlia, Linn. Fig. 741. Lvs. with a blade 3–6 lines long, glandular above, petiole ½–2 in. long, pubescent but not glandular: racemes 4–12-fld.: fls. about 2 lines broad, opening in sunshine. July, Aug. Bogs, Labrador to Alaska, south to Fla. and Ala., and in the Sierra Nevada to Calif.



741. Sundew—Drosera rotundifolia (×⅓).

Other Droseras are to be expected in fine collections, and some of them are more showy than those mentioned above. Some of the best are as follows: *D. binàta,* Labill., of Austral and N. Zeal., with lvs. deeply parted into 2 long, linear lobes. Prop. by root-cuttings. B.M. 3082.—*D. Capénsis,* Linn., of S. Afr., has linear or strap-shape leaf-blades as long as the petiole, and large (1 in. in diam.), rosy red fls. Prop. by root-cuttings. B.M. 6583.—*D dichótoma,* Hort. = D. binata.—*D. lineàris,* Goldie, Lake Superior and W., has linear-obtuse lvs. on naked, erect petioles, and purple fls.—*D. spathulàta,* Labill., Austral., N. Zeal., has short, oblong-spatulate lvs. in a rosette, narrowed into short petioles, and purplish fls. G.C. 1881, 16:852.

W. M.

DRUPE. A fleshy fruit containing a single seed with a bony covering or "stone," as a plum. Fig. 742. A Drupe resembles an akene in being 1-sided, and not splitting, but an akene is dry instead of pulpy or fleshy. The most important drupaceous or stone fruits are peaches, plums, apricots, cherries and raspberries. Each of the fleshy parts of a raspberry is a drupelet.

742. Young drupes (apricots), cut in two, showing ovules. Nat. size.

In drupes of the genus Prunus there are two ovules, but usually only one matures.

DRÝAS (Greek, *wood-nymph*). *Rosàceæ.* A genus of 2 or 3 species of dwarf, hardy, tufted, evergreen, somewhat shrubby plants with oblong lvs. half an inch long, recurved at the margins, shining above, snowy white beneath, and large white or yellow fls. borne singly on slender scapes: calyx glandular-hairy: petals 8–9, broadly obovate: stamens many. The genus is close to Geum, but the species of Geum are herbs with deeply cut foliage. J. W. Manning recommends a soil well furnished with peat.

Dryas octopetala requires a well drained, porous soil, a sunny but not dry position. It is well to shade the foliage from bright sun during the winter months with evergreen branches to prevent the foliage from having a scorched appearance. A capital plant for the rockery. Prop. by cuttings, division, or by seed.

octopétala, Linn. Lvs. oblong, deeply and regularly crenate, downy beneath: scapes 2–3 in. long: fls. white: seeds with a feathered awn over 1 in. long. North temperate and arctic regions.

J. B. KELLER.

DRYMOGLÓSSUM. A genus of small ferns from Japan, with wide creeping rootstalks, and small, entire leaves: sori resembling those of Polypodium. None are advertised in America. Three or four kinds are cult. abroad.

L. M. UNDERWOOD.

DRYMOPHLŒUS (Greek words meaning oak and smooth inner bark). *Palmàceæ,* tribe *Arèceæ.* This genus contains a tropical palm, with very distinct wedge-shaped leaflets and ornamental scarlet fruits, borne every year. It flowers when only a few feet high, and is suitable for pot culture. Spineless palm, with slender, medium caudex: lvs. terminal, equally pinnatisect, the segments cuneate-oblong or linear, broadly oblique, submembranaceous, 3- to many-nerved, the margins recurved at the base: rachis scaly, 3-sided: sheath long: spadix with a short peduncle and slender branches: spathes 2 or many, the lower one 2-crested. Species 12. Australasia and the Pacific islands.

The chances are that most of the plants now known to the American trade as *D. olivæformis* are really *D. appendiculata.* The true *D. olivæformis* is said to have been offered by a few dealers as *Ptychosperma Rumphii. D. appendiculata* was described and figured by William Watson, in Garden and Forest, erroneously as *D. olivæformis,* as explained in B.M. 7202. He adds, "Like all the palms of this section of the order, Drymophlœus requires a tropical moist house with abundance of water at all times." The plant figured was about 14 years old, 3 ft. high, with lvs. about 3 ft. long. The plant takes about six months to mature its fruits.

appendiculàta, Scheff. (*Arèca grácilis,* Griseke, not Roxb. or Thou.). Leaflets wedge-shaped, raggedly cut, serrate. Moluccas, New Guinea. B.M. 7202. G.F. 4:331.

D. olivæfórmis, Mart., has narrower leaflets than the above, and the fruit half immersed in the greatly enlarged perianth.

JARED G. SMITH and W. M.

DRYNÀRIA (Greek, *oak-like*). *Polypodiàceæ.* A genus of 10 or more East Indian ferns, with round naked sori, allied to Polypodium, but with a fine net-work of veins, with free included veinlets, and with either a separate oak-like leaf or with the lower portion of the spur-bearing leaf deeply pinnatifid like an oak leaf. **D. quercifòlia**, with two sorts of lvs., the spore-bearing 2–3 ft. long, is the commonest species. **D. rigidula,** Sw. (*D. diversifòlia*, R. Br.), a similar but larger species from the same region, also appeared at one time in the American trade, but the species are seldom seen in cultivation in this country. *D. musæfòlia* is occasionally seen in fine collections, where it is grown for its striking, simple foliage, which reminds one of the Bird's Nest Fern (Thamnopteris). It is really a Polypodium, which see for description.

L. M. UNDERWOOD.

DRYÓPTERIS (Greek, *oak-fern*). *Polypodiàceæ.* WOOD FERN. A widely distributed genus of handsome ferns with dissected foliage and bearing round sori covered with heart-shaped or reniform indusia, which are fixed at the center or along the sinus. The veins are either wholly free or the lowest united. A considerable number of our common wood ferns belong to this genus. The species have been variously known under the names Lastrea, Aspidium, and Nephrodium. Other species sometimes referred to under this genus may be found under Polystichum. For *D. acrostichoides*, see *Polystichum ;* for *D. decurrens*, see *Sagenia*. In North America, known mostly as *Aspidiums*. For culture, see *Ferns*. Not the same as Doryopteris.

A. *Veins entirely free.*

B. *Pinnæ lobed less than one-third to midrib.*

hírtipes, Kuntze (*Nephròdium hírtipes*, Hook.). Lvs. 2–3 ft. long, 8–16 in. broad, on stalks clothed with dense black scales ; pinnæ with broad, blunt lobes, the lower ones not reduced in size : sori medial on the lobes. India.

BB. *Pinnæ cleft nearly to midrib, or lvs. bipinnate or tripinnatifid.*

C. *Texture thin, membranous ; veins simple or once forked.*

D. *Lower pinnæ gradually reduced to mere lobes.*

Noveboracénsis, Gray (*Aspídium Noveboracénse*, Sw.). Lvs. somewhat clustered from creeping rootstocks, pale green, 1–2 ft. long, tapering both ways from the middle. Canada to N. C. and Ark.

Fischeri, Mett (*Lastrèa opàca*, Mett). Lvs. 6–8 in. long, 2–3 in. wide, bipinnatifid, cut into close, entire lobes, the lowest much reduced; surfaces smooth. Braz.

DD. *Lower pinnæ scarcely smaller than those above.*

E. *Veins forked.*

Thelýpteris, Gray (*Aspídium Thelýpteris*, Sw.). MARSH FERN. Lvs. scattered on wide creeping black rootstocks, 1–2 ft. long ; margins of the spore-bearing pinnæ often strongly convolute: sori 10–12 to each segment. Canada to Fla. and Tex.

EE. *Veins simple.*

simulàta, Dav. Lvs. scattered from a creeping rootstock, 8–20 in. long, 2–7 in. wide, with 12–20 pairs of lanceolate pinnæ : sori rather large, somewhat distant, 4–10 to each segment. Native in N. Y. and N. Eng., where it is often confused with *D. Thelypteris*. G.F. 9:485.

pàtens, Kuntze. Lvs. clustered at the end of a thick rootstock, 2–3 ft. long, 4–10 in. wide, soft-hairy beneath ; pinnæ cut three-fourths to the midrib, the basal segments usually longer. Fla. to Tex. and Trop. Amer. A.G. 20:25.

CC *Texture firm or subcoriaceous ; veins 2–4 times forked.*

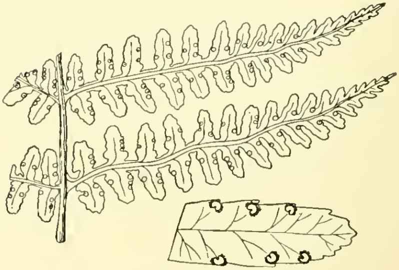
D. *Lvs. bipinnatifid or nearly bipinnate: indusia large, mostly flat.*

cristàta, Gray (*Aspídium cristàtum*, Sw.). Lvs. 1–2 ft. long, with short, triangular pinnæ 2–3 in. long, which are much wider at base. Var. **Clintoniàna** is larger, with pinnæ 4–6 in. long, and with the sori rather near the midvein. Canada to Ark.; also in N. Eu. Hybrids are described with *D. marginalis*. G.F. 9:445.

Goldieàna, Gray (*Aspídium Goldieànum*, Sw.). Lvs. growing in large crowns, 2–4 ft. long, 12–18 in. wide, the pinnæ broadest at the middle : indusia very large. Canada to Ky.—One of our largest and most stately native species.

DD. *Lvs. mostly bipinnate: indusia convex, rather firm.*

Fìlix-màs, Schott (*Aspídium Fìlix-màs*, Sw.). MALE FERN. Lvs. growing in crowns, 1–3 ft. long, sori near the midvein. Used as a vermifuge, as is also the next species. N. Eu., Canada and Colo.



743. Dryopteris marginalis.

marginàlis, Gray (*Aspídium marginàle*, Sw.). Fig. 743. Lvs. 6 in. to 2 ft. long, growing in crowns, mostly in rocky places; sori close to the margin. Canada and southward.—One of our commonest ferns.

DDD. *Lvs. mostly tripinnatifid ; segments spinulose-toothed : indusia shriveling at maturity.*

E. *Leaf-stalks naked, polished.*

viridéscens, Kuntze. Lvs. 18–24 in. long, on stalks two-thirds as long; lower pinnæ largest: sori near the midribs. Japan.

EE. *Leaf-stalks scaly.*

spinulòsa, Kuntze (*Aspídium spinulòsum*, Sw.). Lvs. ovate-lanceolate, with a few pale, deciduous scales at the base : indusia smooth, without marginal glands. Var. **intermèdia,** Underw., has more persistent scales, with a brown center, and the margins of the indusia with stalked glands. One of our commonest wood ferns in the northern states.—Var. **dilatàta,** Underw., has similar scales to the last and tripinnate lvs. In woods, from Canada to Ore.; also in Europe.

Boòttii, Underw. (*Aspídium Boòttii*, Tuckm.). Lvs. elongate-lanceolate, with broadly oblong pinnules : indusia minutely glandular. Canada, N. Y. and N. Eng.

DDDD. *Lvs. ample, 4–5-pinnatifid.*

effùsa, Kuntze. Lvs. 3–4 ft. long, 2 ft. or more wide, with polished stems and short, creeping rootstocks : sori abundant, scattered, often without indusia. Cuba to Brazil.

dissécta, Kuntze (*Lastrèa membranifòlia*, Hort.). Lvs. 1–5 ft. long, 1–3 ft. wide, membranous, decompound; segments broad and blunt; surfaces nearly naked: sori near the margin, abundant. India and Madagascar to Australia.

AA. *Veins not entirely free, the lower veinlets of adjoining segments united.*

Otària, Kuntze (*Lastrèa aristàta*, Hort.). Lvs. 1 ft. long, with a long terminal pinnæ an inch or more wide, with lanceolate lobes, and 6–12 similar lateral pinnæ; texture thin ; surfaces naked ; veins united half way from the midrib to the edge. Ceylon to the Philippines. —Good for table ferneries, but slow of growth.

móllis, Kuntze. Lvs. 1–2 ft. long, 8–12 in. wide, bipinnatifid, the pinnæ cut into blunt lobes; lower pinnæ distant from the others and somewhat shorter; surfaces finely villose. Trop. regions of both hemispheres. Probably several species are confused under this name.

Philippinénsis, Baker. Lvs. 2–3 ft. long, 12–18 in. wide, bipinnatifid, smooth, with a naked rachis; lower pinnæ scarcely smaller: sori midway from midrib to margin, with firm, smooth indusia. Philippines.

L. M. Underwood.

DUCHÈSNEA. See *Fragaria*.

DUCK-WEED. *Lemna*.

DUCKWHEAT. Some years ago, as the story goes, a man in New England shot a wild duck, and in the crop found strange seeds. These seeds were planted, and the flour from the grain was found to make good pancakes. He increased his stock to hundreds of bushels. The grain was offered by seedsmen as Duckwheat. It seems not to have had great popularity, and for the past 2 or 3 years it evidently has not appeared in catalogues. It turns out that this grain is the India wheat or Tartarian buckwheat, *Fagopyrum Tataricum*, an Asian grain, which has been known in this country for some time. It is earlier than buckwheat, but is very similar to it. See *Buckwheat* and *Fagopyrum*.

L. H. B.

DUDAIM MELON. *See Cucumis.*

DUFOUR, JOHN JAMES. A Swiss vigneron, who was at the head of a colony to grow the wine grape in Kentucky, and the author of "Vine Dresser's Guide," published in Cincinnati in 1826. The Kentucky experiment failed, and the colony then settled in southern Indiana, on the banks of the Ohio river; and this settlement is now the city of Vevay. Here Dufour died in 1827. This Indiana experiment brought out the merits of the Alexander grape, a native, and thereby did much to establish an American viticulture. For detailed account of the Dufours and their associates, and the results of their work, see Bailey, Evolution of our Native Fruits.

DUGUÈTIA (probably made from a personal name). *Anonàceæ.* A dozen South American trees differing from Anona in technical characters, particularly in the imbricated petals, which are wide-spreading in flower (in Anona the petals are valvate). **D. longifòlia**, Baill. (*Anòna longifòlia*, Aubl.), is a small tree: lvs. oblong-acuminate, mucronate and smooth: fls. axillary and stalked, the 2 series of petals much alike; inflorescence lateral; outer stamens sterile and petaloid: fr. ovate-globose, dotted and reticulated, nearly smooth, flesh-colored. Guiana and Peru. Recently introduced into southern Florida as a fruit-plant, but very little known.

L. H. B.

DULÍCHIUM (old Latin name). *Cyperàceæ.* One perennial species (*D. Spathàceum*, Pers.), in eastern N. Amer. Grass-like, with terete leafy culms, 2–3 ft. tall: grows in ponds and swales. Has been offered by collectors as a bog plant.

DURÁNTA (after Castor Durantes, physician and botanist, died 1590). *Verbenàceæ.* About 10 species of tropical American shrubs, of which 2 kinds are cultivated outdoors in Florida and California, and in a few northern greenhouses. The best known kind has long racemes of blue, 5-lobed fls., followed by yellow berries which remain all winter. It is said to be used for ornamental hedges in warm regions. Shrubs, glabrous or woolly, often armed with axillary spines: lvs. opposite or in whorls, entire or toothed: racemes long and terminal or short and axillary: fls. small, short-pedicelled in the axis of a small bract; corolla limb of 5 spreading oblique or equal lobes; stamens 4, didynamous.

A. *Stems without prickles.*

Plumièri, Jacq. Golden Dew Drop. Shrub, 6–15 ft. high: branches ash-colored, villous: lvs. opposite, elliptic, acute, entire or obtusely and unequally saw-toothed above the middle: fls. pale blue or lilac, with 2 purple streaks down the middle of the 2 smaller and narrower lobes. The above description is from B.R. 3:244, where it is said that another plant was cultivated which had long lanceolate lvs., with deep, close saw-teeth and green branches. There is a white-fld. variety.

AA. *Stems with a few prickles or spines.*

Ellísia, Jacq. This is at least horticulturally distinct from the above by reason of the lighter color of its fls., but it has been lately referred to *D. Plumieri*. B.M. 1759 shows the lower half of each lobe white, and a few short spines on the stem. It adds, "two kinds [of Duranta], one with thorns and one constantly without, are * * * cultivated. The lvs. of the smooth are larger and more coarsely serrated, and the branches more rounded than in the prickly Duranta."

W. M.

DUSTY MILLER. *Lychnis coronaria*; also species of *Centaurea* and *Senecio*.

DUTCHMAN'S BREECHES. *Dicentra Cucullaria.*

DUTCHMAN'S PIPE is *Aristolochia*.

DUVAUA. A synonym of *Schinus*.

DÝCKIA (after Prince Salm-Dyck, German botanist, and author of a great work on succulent plants). *Bromeliàceæ.* About 57 species of succulent plants from South America, somewhat resembling century plants, but with smaller spines, as a rule, and flowering regularly. They are usually stemless, and the lvs. form dense rosettes. For culture, see *Agave*. They are rarely cultivated in Florida and California, and in a few northern collections. The following have showy yellow fls. Latest monograph in Latin by C. Mez in DC. Monogr. Phan. vol. 9 (1896).

A. *Inflorescence amply branched or panicled.*

altíssima, Lindl. Lvs. spiny at the margin: floral bracts small, all manifestly shorter than the fls. Braz. Baker's plant of this name is really *D. encholirioides*, Mez, which is distinguished by the filaments. Beyond the tube they are free in the tree *D. altissima*, while in Baker's plant they are grown together about a twelfth of an inch. The sepals are obtuse in Lindley's plant, but acute in Mez's.

AA. *Inflorescence not branched, a raceme or spike.*

B. *Fls. with scarcely any pedicel; filaments forming a tube.*

rariflòra, Schult. Lvs. with small spines on the margin, shorter than in *D. altissima*: sepals not emarginate at the apex: upper sheaths of the scape shorter than the internodes. Braz. B.M. 3449. B.R. 21:1782.

BB. *Fls. with a short but conspicuous pedicel; filaments not forming a tube all the way.*

C. *Fls. loosely disposed, erect.*

gemellària, Morr. This is the plant which Baker calls *D. sulphurea*, not Koch's plant.

CC. *Fls. more densely disposed, spreading.*

sulphùrea, C. Koch, not Baker. Lvs. with small spines at the margin: sheaths of the scape longer than the internodes, the higher ones entire: bracts lanceolate, the lowest conspicuously longer than the pedicelled fls.: blades of the petals wide and longer than the stamens. Brazil.

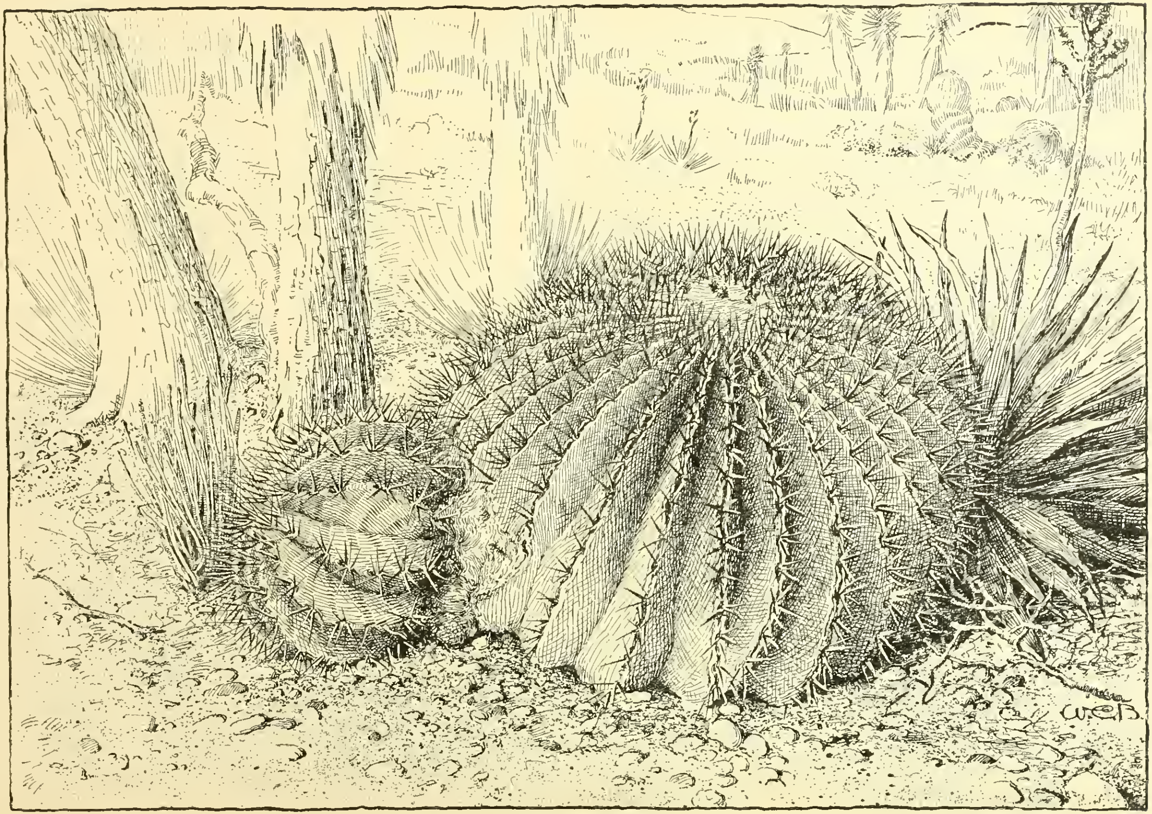
W. M.

DYER'S WEED. *Reseda Luteola.*

DÝPSIS (obscure name). *Palmàceæ*, tribe *Arèceæ.* Perhaps half a dozen species of Madagascar palms that have been poorly described and are little known. They are all small, unarmed palms, with reed-like stems. Lvs. terminal, entire, bifid at the apex or pinnatisect; segments split at the apex or irregularly toothed, the apical ones confluent: sheath short: spadices long, loosely fld.: fruit small, oblong or ovoid, straight or curved, oblique at the base.

No species of Dypsis are common in cultivation, as they possess but little beauty. They are among the easiest and quickest to germinate. All of them require a stove temperature. *D. Madagascariénsis*, Nicholson, is also known as *Areca Madagascariénsis*, Mart. *D. pinnatifròns*, Mart. (*A. gracilis*, Thou.), is one of several plants that have been known as *Areca gracilis*. It is a pretty palm, now grown in large quantities by some dealers.

Jared G. Smith and G. W. Oliver.



Photographed by Dr. Trelease

Echinocactus ingens

A flowering plant, with a lateral offset. The offset shows the zebra-striping of the ribs, characteristic of young plants. On the smaller specimen the spines are superficial; on the larger one they are in grooves, due to the developing of corky growth. The old-age elongated form is seen in the distance at the right. Tehuacan, Mexico.

E

EARTH NUT, EARTH PEA. English names for the Peanut, or Goober, *Arachis hypogæa.* Also *Apios.*

EATÒNIA (Amos Eaton, American botanist, 1776–1842; author of popular Manual of Botany of the United States, which was for a long time the only general work available for American students). *Gramíneæ.* A North American genus of 4 or 5 species of tufted perennial grasses. Three kinds have been catalogued by Wilfred Brotherton, Rochester, Mich.

A. *Panicle dense, spike-like, strict.*

obtusàta, Gray. Spikelets crowded on the short, erect panicle-branches: upper empty glume rounded-obovate, very obtuse. Dry soil.

AA. *Panicle more loose and slender.*

Pennsylvánica, Gray. Lvs. 3–6 in. long: panicle-branches lax, nodding. Moist woods and meadows.

Dúdleyi, Vasey. Lvs. 1–2 in. long: panicle-branches spreading in flowering time, afterwards erect.

A. S. HITCHCOCK.

EBONY. *Diospyros Ebenus.*

ECBÁLLIUM (Greek, *to throw out*). *Cucurbitàceæ.* SQUIRTING CUCUMBER. The Squirting Cucumber is one of the most amusing and disconcerting of all plants. Few if any cultivated plants fire their seeds at one with such startling suddenness and force. It is a hardy annual trailing vine, easily grown in any garden. When ripe, the oblong, prickly fruit squirts its seeds at the slightest touch, or sometimes at the mere vibration of the ground made by a person walking by. The boy or girl who did not like this plant never lived. Some of the old herbalists called this plant *Cucumis asininus.* Another curious fact about the plant is that a powerful cathartic is made from the juice of the fruit, which has been known for many centuries. A preparation of it is still sold in the drug stores as *Trituratio Elaterini.* Ecballium has only one species, and is closely related to the important genera Cucumis and Citrullus. With them it differs from Momordica in lacking the 2 or 3 scales which close the bottom of the calyx. Other generic characters are: prostrate herb, fleshy, rough hairy: lvs. heart-shaped, more or less 3-lobed: tendrils wanting: fls. yellow, the staminate in racemes, pistillate usually from the same axils with the staminate fls.; calyx 5-cut. It is a native of the middle and eastern Mediterranean regions, especially rich, moist forests. Sims, in the Botanical Magazine, says the plant "is generally considered as an annual, but if the soil is dry and the situation sheltered, the root will survive two or three winters, and the plants will flower earlier and spread farther than those of the same year."

Elatèrium, A. Rich. (*Momórdica Elatèrium,* Linn.). SQUIRTING CUCUMBER. Fig. 744. Described above. B.M. 1914.

W. M.

ECCREMOCÁRPUS (Greek, *pendent fruits*). *Bignoniàceæ.* Three to five species of tall, somewhat woody plants from Peru and Chile, climbing by branched tendrils at the end of the twice pinnate leaves, and having very distinct flowers of somewhat tubular shape, which are colored yellow, orange or scarlet. The species mentioned below is doubtless perennial in southern California, where it is said to show best when climbing over shrubbery, but in the East it is treated as a tender annual and is perhaps usually trained to a trellis or south wall. It bears flowers and fruits at the same time, and the orange flowers make an effective contrast with the pale green foliage. The genus belongs to an order famous for its superb tropical climbers, but in its own tribe only two genera have any horticultural fame, and that small. These are Jacaranda and Colea, having a 2-celled ovary, while that of Eccremocarpus is 1-celled. Eccremocarpus has two sections, in one of which the corollas are cylindrical, but in the section Calampelis, to which *E. scaber* belongs, the corolla has a joint at a short distance beyond the calyx, then swells out on the under side, and suddenly constricts into a neck before it reaches the small, circular mouth, surrounded by 5 short, rounded lobes.

scàber, Ruiz & Pav. (*Calámpelis scàber,* D. Don). Although the specific name means rough, the wild plant is only sparingly puberulous, and in cultivation entirely glabrous. About 10 ft. high: lvs. bipinnate; lfts. obliquely cordate, entire or saw-toothed: fls. 1 in. long, orange, in racemes. July, Aug. Chile. B.R. 11:939.

PETER HENDERSON & CO.

ECHEVÈRIA. All referred to *Cotyledon.*

ECHINÀCEA (Greek, *echinos,* hedgehog; alluding to the sharp-pointed bracts of the receptacle). *Compósitæ.* PURPLE CONE-FLOWER. Four species of North American perennial herbs, two of them from Mexico, the others native to the United States, and cultivated in our hardy borders. They are closely related to Rudbeckia, but their rays range from flesh color, through rose, to purple and crimson, while those of Rudbeckia are yellow or partly (rarely wholly) brown-purple. The high disk and the downward angle at which the rays are pointed are charming features of Echinaceas. The disk is only convex at first, but becomes egg-shaped, and the receptacle conical, while Rudbeckia has a greater range, the disk from globose to columnar, and the receptacle from conical to cylindrical. Echinaceas and Rudbeckias are stout, and perhaps a little coarse in appearance, but their flowers, sometimes 6 in. across, are very attractive, and borne in succession for two months or more of late summer. With the growing appreciation of hardy borders and of native plants, it should be possible to procure 4 or 5 distinct colors in the flower, associated with low, medium and tall-growing habits. They do well

744. Ecballium Elaterium (× 1/3).

in ordinary soils, and may be used to help cover unusually dry and exposed spots. They respond well to rich soil, especially sandy loam, and prefer warm and sunny sites. They are perennials of easy culture. Prop. by division, though not too frequently; sometimes by seeds. The roots are black, pungent-tasted, and are said to be used in popular medicine under the name of Black Sampson. Bentham & Hooker refer Echinacea to Rudbeckia.

purpùrea, Mœnch. Commonly not hairy, typically taller than *E. angustifolia*, 2 ft. or more high: lvs. ovate-lanceolate, or the lower ones broadly ovate, often 5-nerved, commonly denticulate or sharply serrate, most of them abruptly contracted into a margined petiole: rays at first an inch long and broadish, later often 2 in. long or more, with the same color range as *E. angustifolia*, but rarely almost white. Rich or deep soil. Va. and Ohio to Ill. and La.

Var. **serótina**, Nutt. (*E. intermèdia*, Lindl.). The varietal name means late-flowering, but the chief point is the hairy or bristly character of the plant. L.B.C. 16:1539. P.M. 15:79.—J. B. Keller says "this is, perhaps, the best form of the genus for garden purposes, the rays being much brighter colored, broader and not rolling at the edges."

angustifòlia, DC. Bristly, either sparsely or densely: lvs. narrower than in *E. purpurea*, from broadly lanceolate to nearly linear, entire, 3-nerved, all narrowed gradually to the base, the lower into slender petioles: flower-heads nearly as large as in *E. purpurea*, but sometimes much smaller. Prairies and barrens, Saskatchewan and Neb. to Tex., east to Ill., Tenn. and Ala. B.M. 5281. G.W.F. 25.—This species has several forms, which approach and run into *E. purpurea*. L. H. B.

ECHINOCÁCTUS (Greek, *spine* and *cactus*). *Cactàceæ*. A very large genus of globular, strongly ribbed, and strongly spiny forms. Sometimes they become very short-cylindrical; occasionally the ribs are broken up into tubercles which resemble those of Mammillaria; and rarely spines are entirely wanting. The flowers usually appear just above the young spine-bearing areas, but sometimes they are further removed, and occasionally they are in the axil of a tubercle. The ovary bears scales which are naked or woolly in the axils, and the fruit is either succulent or dry. The genus is well developed within the United States, about forty species having been recognized, but its extreme northern limit is the southern borders of Colorado, Utah, and Nevada, apparently having spread from the great arid plateau regions of Mexico proper and Lower California. The genus extends throughout Mexico and Central America, and is well represented in the drier regions of South America. The genera Astrophytum and Lophophora are here included, although they seem to be very different from the typical forms of Echinocactus. It is impossible to identify with certainty all of the specific names found in trade catalogues, but the following synopsis contains the great majority of them. In all cases the original descriptions have been consulted, and in some cases it is certain that a name originally applied to one form has been shifted to another. The following synopsis may be useful, therefore, in checking up the proper application of names, but it may thus leave some of the common species of the trade unaccounted for. No attempt is made to group the species according to relationships, but a more easily handled artificial arrangement, based chiefly upon spine characters, is used It must be remembered that the species are exceedingly variable, especially under cultivation, and large allowance must be made for the characters given in the key and in the specific descriptions.

Echinocactus Poselgerianus, A. Dietr., proves to be *Mammillaria Scheerii*. The following horticultural names have not been identified: *E. chrysanthus* (*chrysacanthus ?*), *Drægeanus trifurcatus*.

John M. Coulter.

When starting with newly collected plants of Echinocactus the mutilated roots should be well cut back to within an inch or two of the base of the plants. If the plants are procured in early summer, the best way to get new roots on them is to place the plants on a bench of a greenhouse with a southern exposure, in a mound of fine gravel about eight or ten inches deep. Insert the base of the plants in the gravel and syringe them overhead once a day on bright days. The gravel gets very hot with the sun, and in this they root freely in three or four weeks. When well rooted they can be placed in pots. A good compost consists of six parts of good fibrous loam, one part sand and one part brick rubble. Pots should be just large enough to hold the plants and should be drained about one-fifth of their depth. From March to May is a good time to pot established plants, but if the soil is good and the drainage all right they can remain in the same pots for two or three years.

The plants should receive all the sunlight possible at all times of the year. During the winter they should be watered very sparingly, but in spring and summer they can be watered freely and syringed overhead on bright days. In winter Echinocactus require a night temperature of from 45° to 50° Fahr., and the atmosphere should be perfectly dry. Propagation is effected by seeds, cuttings and grafting. Robert Cameron.

The diversity of form exhibited in the genus Echinocactus since the genera Astrophytum and Lophophora are now included, makes this one of the most interesting of the whole Cactus family. Unlike most globular forms of Cacti, they do not readily produce offsets; consequently they must be propagated by seeds if one wishes to increase these plants in quantity. Seeds of Echinocactus, and, in fact, most cactaceous plants, will germinate as freely as seeds of other plants, provided they have been allowed to ripen properly before gathering and carefully dried afterwards. From the experience of the writer, who has raised some hundreds of seedling Cacti and sown them every month in the year, he has found the months of May and June to be by far the most favorable for germination. Seeds of Echinocactus will then germinate in five or six days, while during the winter months it takes almost as many weeks. Opuntias will germinate in even less than six days. They germinate most readily of all the Cactaceæ, and grow the fastest afterwards, while Mammillarias are the slowest to germinate and grow the slowest afterwards. The seeds should be sown in well-drained 4-inch pots in a finely sifted mixture of one part leaf-mold, one part loam and one part charcoal dust and silver sand. The surface should be made very smooth, and the seeds pressed lightly into the soil with the bottom of a flower-pot and then covered with about three-eighths of an inch of fine silver sand. This allows the seedlings to push through readily and prevents the soil from crusting on the surface of the pots, as they usually have to stay in their seedling pots at least one year. The pots should be placed in a greenhouse where they will receive plenty of light but not the direct sunlight, for, although Cacti are natives of desert regions, the writer has found from experience that the seedlings will simply roast if exposed to full sunlight under glass. For the first winter, at least, the seedlings should be kept in a temperature of not less than 60° and carefully looked over every day to ascertain the condition of the soil, for, although they should be kept on the dry side, they must never be allowed to become quite dry during the seedling stage. When about a year old they may be transplanted to shallow pans not more than 6 inches in diameter, and prepared with the same mixture as for seedling pots. These pans will be found better than small pots, because the soil may be kept more evenly moist and the seedlings do better in consequence.

When grown from 2 to 3 inches in diameter, seedling Echinocactus may be transferred to pots, using sizes only just large enough to accommodate them, as they make but few roots. Pot them in a mixture of two parts fibrous loam, one part leaf-mold and one part pounded brick and silver sand. During the spring and summer months, established plants may be given a liberal supply of water, but must be studiously watered during the fall and winter months. During the winter they should be given a light position in a dry greenhouse, with a night temperature of 45° to 50°, and a rise of 10° by day. For the summer, they may be either kept in an airy greenhouse or placed in some convenient position outside, plunging the pots in the soil or in some light non-conducting material. Some of the species will commence to blossom in May and others at intervals during the summer. The flowers vary considerably in size, and embrace a good range of color, from white to deep yellow, and from the faintest purple to deep rose. They do not readily produce seed (in New England, at least) unless artificially fertilized. Like most of the Cactus family, the more cylindrical species will readily unite when grafted upon other kinds, not only in the same genus, but in other genera of Cactaceæ, and for weak-growing species it may often be an advantage to graft upon some stronger-growing species. *Cereus Baumanni* (or *C. colubrinus*) makes an excellent stock to graft upon, choosing stock plants of reasonable size and height. The system known as "wedge-grafting" is perhaps best for the purpose, and the early spring months, or just as the growing season is about to commence, is the best time for grafting.

If plants of Echinocactus can be kept in a healthy condition, they are not much troubled with insect pests; mealy-bug is their worst enemy and should be removed at once with a clean mucilage brush. As a guide to amateurs, the writer has found the following to be among the most easily grown: *Echinocactus capricornis, E. coptonogonus, E. cornigerus, E. Grusoni, E. horizonthalonius, E. longihamatus, E. myriostigma, E. setispinus, E. Texensis, E. Williamsii* and *E. Wislizeni*

EDWARD J. CANNING.

INDEX.

Anhalonium, 51.
arrigens, 30.
Astrophytum, 50.
bicolor, 35.
brevihamatus, 5.
capricornis, 15.
coptonogonus, 13.
cornigerus, 9.
crispatus, 30.
cylindraceus, 2.
Echidne, 23
electracanthus, 22.
Emoryi, 25.
flavovirens, 36.
Grusoni, 44.
helophorus, 28.
hexædrophorus, 31.
horizonthalonius, 21.
ingens, 20.
intertextus, 37.
Johnsoni, 39.
Lecontei, 42.
leucacanthus, 18.
Lewinii, 52.
longihamatus, 3.
Lophophora, 51.
lophothele, 32.
micromeris: see *Mammillaria*.
Mirbelli, 19.
Monvillii, 11.
multicostatus, 14.
myriostigmus, 50.
obvallatus, 29.
Orcuttii, 38.
ornatus, 19.
orthacanthus, 36.
Ottonis, 34.
Pfeifferi, 12.
phyllacanthus, 17.
pilosus, 47.
polycephalus, 40.
polyancistrus, 10.
recurvus, 26.
Rinconensis, 16.
robustus, 33.
Saltillensis, 45.
Scopa, 46.
setispinus, 27.
Sileri, 43.
Simpsoni, 48.
sinuatus, 6.
Texensis, 24.
Treculianus, 6.
turbiniformis, 49.
uncinatus, 1, 7.
Vanderæyi, 23.
viridescens, 41.
Visnaga, 20.
Whipplei, 8.
Williamsii, 51.
Wislizeni, 4.
Wrightii, 1.

A. *Spines, or some of them, hooked.*

B. *Central spine solitary.*

1. **Wrightii** (*E. uncinàtus*, var. *Wrìghtii*, Engelm.). Oval, 3–6 in. high, 2–3½ in. in diam.: radial spines 8, arranged as in uncinatus; central spine solitary, angled, flexuous and hooked, elongated (2–6 in.), erect, straw-color, with dark tip: flowers 1–1½ in. long, dark purple. Texas and northern Mexico.

BB. *Central spines 4.*

C. *Some or all of the spines annulate.*

2. **cylindràceus**, Engelm. Globose to ovate or ovate-cylindrical, simple or branching at base, becoming as much as 3 ft. high and 1 ft. in diam.: ribs 13 in younger specimens, 20–27 in older ones, obtuse and tuberculate: spines stout, compressed, more or less curved, reddish; radials about 12, with 3–5 additional slender ones at upper edge of areola, 1–2 in. long, the lowest stouter and shorter and much hooked; centrals 4, very stout and 4-angled, about 2 in. long and one-twelfth to ⅛ in. broad, the uppermost broadest and almost straight and erect, the lowest decurved: flowers yellow. Southwestern United States and Lower California.

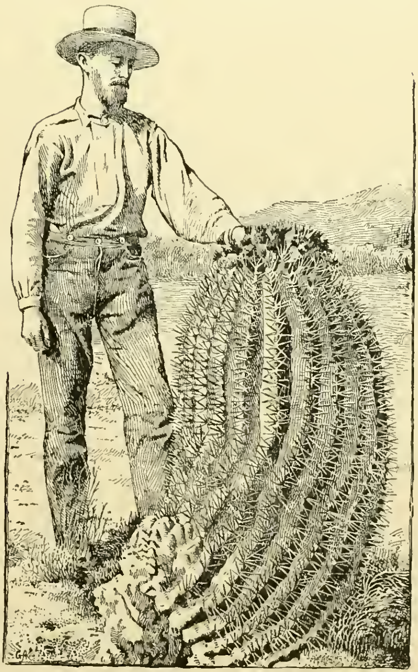
3. **longihamàtus**, Gal. Subglobose or at length ovate, becoming 1–2 ft. high: ribs 13–17, often oblique, broad, obtuse, tuberculate-interrupted: spines robust, purplish or variegated when young, at length ashy; radials 8–11, spreading, straight or curved or flexuous, the upper and lower ones 1–3 in. long, the laterals 2–4 in.; centrals 4, angled, the upper ones turned upwards, straight or curved or twisted, the lower one stouter, elongated (3–8 in.), flexuous and more or less hooked: flowers yellow, tinged with red, 2½–3½ in. long. Texas and Mexico.

4. **Wislizeni**, Engelm. At first globose, then ovate to cylindrical, 1⅔–4 ft. high: ribs 21–25 (13 in small specimens), acute and oblique, more or less tuberculate: radial spines three-fifths to 2 in. long, the 3 upper and 3–5 lower ones stiff, straight or curved, annulate, red (in old specimens the 3 stout upper radials move toward the center and become surrounded by the upper bristly ones), the 12–20 laterals (sometimes additional shorter ones above) bristly, elongated, flexuous, horizontally spreading, yellowish white; centrals 4, stout, angled, and red, one and three-fifths to three and one-fifth in. long, the 3 upper straight, the lower one longest (sometimes as much as 4–5 in.), very robust (flat and channeled above), hooked downward: flowers yellow or sometimes red, two to two and three-fifths in. long. From southern Utah to northern Mexico and Lower California.

CC. *None of the spines annulate.*

5. **brevihamàtus**, Engelm. Globose-ovate, very dark green: ribs 13, deeply tuberculate-interrupted, the tubercles with a woolly groove extending to the base: radial spines mostly 12, terete, straight, white or yellowish, with dusky tips, ½–1 in. long, the upper longer; central spines 4 (rarely 1 or 2 additional ones), flattened, white with black tips, the 2 lateral ones divergent upward, straight or a little recurved, 1–2 in. long, the uppermost one weaker, the lower stoutest and darkest, porrect or deflexed, hooked downward, ¾–1 in. long: flowers funnelform, rose-color, 1–1½ in. long. Southwestern Texas and New Mexico.

6. **sinuàtus**, Dietr. (*E. Treculiànus*, Labour.). Globose, 4–8 in. in diam., bright green: ribs 13, oblique, acute, tuberculate-interrupted, the tubercles short-grooved: radial spines 8–12, setiform and flexible, the



745. Echinocactus Emoryi, var. rectispinus.

3 upper and 3 lower purplish brown and straightish (the lower ones sometimes more or less hooked), four-fifths to 1 in. long, the 2–6 laterals more slender, longer (1 to one and two-fifths in.), often flattened, puberulent and whitish, sometimes flexuous or hooked; central spines 4, puberulent, yellowish (or purplish variegated), the 3 upper ones slender, flattened or subangled, erect and generally straight (rarely hooked), one and three-fifths to 2 in. long, the lowest one much stouter, flattened or even channeled, straw-color, flexuous, more or less hooked (sometimes straight), 2–4 in. long: flowers yellow, 2–3 in. long. Texas, Arizona, and northern Mexico.

7. **uncinàtus**, Gal. Glaucescent, globose to oblong: ribs 13, obtuse, tuberculate-interrupted: radial spines 7 or 8, 1–2 in. long, the upper 4 or 5 straw-color, straight, flattened, the lower 3 purplish, terete and hooked; centrals 4, the upper 3 rather stout and straight, about 1 in. long, the lowest one very long, flattened, hooked at apex: flowers brownish purple. Northern Mexico.

8. **Whipplei**, Engelm. Globose-ovate, 3–5 in. high, 2–4 in. in diam.: ribs 13–15 (often oblique), compressed and tuberculately interrupted: radial spines usually 7, compressed, straight or slightly recurved, ½ to three-fifths in. long, lower ones shorter than the others, all white excepting the two darker lowest laterals; central spines 4, widely divergent, the uppermost one flattened, straight and white, 1 to one and three-fifths in. long, turned upward in the plane of the radials (completing the circle of radials), the others a little shorter, quadrangular-compressed, dark brown or black, becoming reddish and finally ashy, the 2 laterals straight, the lowest one stouter and sharply hooked downward: flower greenish red. Northern Arizona.

BBB. *Central spines 5 to 8.*

9. **cornígerus**, DC. Globose or depressed-globose, 10–16 in. in diam.: ribs about 21, very acute and wavy (not tuberculately interrupted): radial spines 6–10, white and comparatively slender, or wanting; centrals red and very robust, angular-compressed, with long, sharp, horny tips, the upper 3 erect-spreading, 1–1½ in. long, the lower 2 weaker and declined, the central one longer, more rigid and keeled, very broad (one-fifth to one-third in.) and hooked downward: flowers purple, 1–1½ in. long. Mexico and Central America.

10. **polyancístrus**, Engelm. & Bigel. Ovate or at length subcylindric, becoming 4–10 in. high and 3–4 in. in diam.: ribs 13–17, obtuse, tuberculately interrupted; radial spines 20 or more, compressed and white, the uppermost wanting, the 4 upper ones broader and longer (1–2 in.) and dusky-tipped, the laterals shorter (four-fifths to one in.), the lowest very short (½ in.) and subsetaceous; central spines of several forms, the uppermost one (rarely a second similar but smaller one above or beside it) compressed-quadrangular, elongated (3–5 in.), white with dusky tip, curved upward, the other 5–10 teretish or subangled, bright purple-brown; upper ones long (2–4 in.) and mostly straight, the others gradually shortening (to about 1 in.) downward and sharply hooked: flowers red or yellow, 2 to two and two-fifths in. long and wide. Nevada and southeastern California.

AA. *Spines not hooked.*

B. *Central spines none or indistinct.*

11. **Monvíllii**, Lem. Stout, globose and bright green: ribs 13–17, tuberculate, broadest toward the base, undulate; tubercles somewhat hexagonal, strongly dilated below: radial spines 9–12, the lower ones somewhat longer, very stout, spreading, yellowish translucent, reddish at base; central wanting: flowers varying from white to yellow and red. Paraguay.

12. **Pfeifferi**, Zucc. Oblong-globose, becoming 1–2 ft. high and 1 ft. in diam.: ribs 11–13, compressed and somewhat acute: spines 6, about equal, rigid, straight, divergent or erect, pale transparent yellow with a brownish base; very rarely a solitary central spine. Mexico.

13. **coptonógonus**, Lem., var. **màjor**, Salm-Dyck. Depressed, from a large indurated naked napiform base, 2–4 in. across the top: ribs 10–15, acute from a broad base, more or less transversely interrupted and sinuous: spines 3, annulate, very stout and erect from deeply sunken areolæ, reddish when young, becoming ashy gray; upper spine stoutest, erect and straight, or slightly curved upward, flattened and keeled, and occasionally twisted, 1½–2¼ in. long; the two laterals erect-divergent, straight or slightly curved, terete above and somewhat quadrangular below, 1–1½ in. long; all from an abruptly enlarged base: flowers not seen, but said to be small and white, with purplish median lines. Mexico.

14. **multicostàtus**, Hildmann. Depressed-globose: ribs very numerous, 90 to 120, compressed into thin plates which run vertically or are twisted in every direction: spines exceedingly variable, in some cases wanting entirely, in others 3 or 4, short, rigid, and translucent yellow; in others more numerous, larger, and often flattish; in still other cases very long and flat, interlacing all over the plant; no centrals: flower white, with a broad purple stripe.

15. **capricórnis**, A. Dietr. Globose: ribs about 11, broad, spotted all over with white dots: clusters of spines distant, usually seen only near the apex; spines 5–10, long and flexuous; centrals not distinct: flowers large, yellow. Mexico.

16. **Rinconénsis**, Poselg. Cylindrical, covered with ivory white spines which are tipped with crimson; spines 3, with no centrals: flower large, purple-crimson, darker at base. Northern Mexico.

17. **phyllacánthus**, Mart. From globose to cylindrical, with depressed vertex, simple or proliferous, two and one-third to three and three-fifths in. broad: ribs 40–55 (sometimes as few as 30), very much crowded and compressed, thin, acute, very wavy, continuous or somewhat interrupted: radial spines 5 (sometimes 6 or 7), straight and spreading, the 2 lowest ones white, rigid, one-sixth to one-fourth in. long, half as long as the 2 darker, angled, larger laterals, the uppermost spine thin and broad, channeled above, faintly annulate, flexible, grayish pink, three-fifths to 1 in. long; central spines none: flowers small, dirty white. Mexico.

BB. *Central spine solitary (sometimes 2–4 in E. crispatus, helophorus, and setispinus, or wanting in lophothele).*

C. *Ribs less than 13.*

18. **leucacánthus**, Zucc. Somewhat clavate-cylindrical, pale: ribs 8–10, thick, obtuse, strongly tuberculate, the areolæ with strong wool: radial spines 7 or 8, similar, straight, finely pubescent, at first yellowish, at length white; central spine solitary, more or less erect, rarely wanting: flowers light yellow. Mexico.

19. **ornàtus**, DC. (*E. Mirbélli*, Lem.). Subglobose: ribs 8, broad, compressed, vertical, thickly covered with close-set white woolly spots, making the whole plant almost white: radial spines 7, straight, stout, yellowish or becoming gray; central spine solitary. Mexico.

20. **íngens**, Zucc. (*E. Visnàga*, Hook.). Very large (sometimes as much as 10 ft. high and as much in circumference), globose or oblong, purplish toward the top: ribs 8, obtuse, tuberculate: areolæ large, distant, with very copious yellowish wool: radial spines 8 or more; central spine solitary; all the spines shaded yellow and red or brownish, straight, rigid, and interwoven: flowers bright yellow, about 3 in. broad. Mexico.

21. **horizonthalònius**, Lem. Glaucous, depressed-globose or at length ovate or even cylindric with age, 2–8 in. high, 2½–4 in. in diam.: ribs 8–10 (fewer in very young specimens), often spirally arranged, the tubercles scarcely distinct by inconspicuous transverse grooves: spines 6–9, stout, compressed, reddish (at length ashy), recurved or sometimes almost straight, nearly equal, four-fifths to 1½ in. long (sometimes long and slender and almost terete, sometimes short, stout and broad); radials 5–8, upper ones weaker, lowest wanting; a single stouter decurved central (sometimes wanting): flowers pale rose-purple, 2½ in. long or more. New Mexico and northern Mexico.

CC. *Ribs 13-27.*

22. **electracánthus**, Lem. Globose or thick cylindrical, becoming 2 ft. high and 1 ft. in diam.: ribs about 15: radial spines about 8, equal, rigid, spreading, yellowish, about 1 in. long; the central one solitary, red at base: flowers clear yellow. Mexico.

23. **Echídne,** DC. (*E. Vanderæyi*, Lem.). Depressed-globose, 5–7 in. in diam., 3–4 in. high: ribs 13, acute: radial spines 7, broad, rigid, spreading, yellowish, 1 in. or more long; central spine solitary and scarcely longer than the others: flowers bright yellow, 1 in. or more long. Mexico.

24. **Texénsis,** Hopf. Mostly depressed (sometimes globose), 8–12 in. in diam., 4–6 in. high, simple: ribs mostly 21 (sometimes 27, and in smaller specimens 13 or 14) and undulate: spines stout and fasciculate, reddish, compressed; the exterior 6 or 7 radiant, straightish or curved, unequal, ½ to four-fifths in. long in some cases, one and one-fifth to 2 in. in others, much shorter than the solitary and stout recurved central, which is sometimes one-sixth to ¼ in. broad: flowers about one-fifth in. long, parti-colored (scarlet and orange below to white above). Texas and northeastern Mexico.

25. **Émoryi,** Engelm., var. **rectispìnus,** Engelm. Fig. 745. Globose, at length cylindrical: ribs 13–21, obtuse and strongly tuberculate: radial spines 7–9, very unequal, the 3 upper ones 4–5 in. long, the lower 1½–3 in. long and paler; the central very long (12–13 in.), straight or slightly decurved. Southwestern United States and northern Mexico.

26. **recúrvus,** Link & Otto. Subglobose and very stout: ribs about 15, covered with broad, dark red spines, the radials spreading, the central one recurved and very stout. Mexico (?).

27. **setispìnus,** Engelm. Subglobose, 2 to three and one-fifth in. in diam.: ribs 13, more or less oblique, often undulate or somewhat interrupted: radial spines 14–16, setiform and flexible, two-fifths to four-fifths in. long, the uppermost (the longest) and lowest ones yellowish brown, the laterals white; central spines 1–3, setiform and flexuous, dark, 1 to one and one-fifth in. long: flowers funnelform, one and three-fifths to 3 in. long, yellow, scarlet within. Texas and Mexico.

28. **helóphorus,** Lem. Depressed globose, light green, with purple-red veins: ribs about 20, compressed, obtuse: radial spines 9–12, very stout and porrect; central spines 1–4, stronger and annulate; all the spines pearl-gray. Mexico.

CCC. *Ribs 30 or more.*

29. **obvallàtus,** DC. Obovate-globose, depressed: ribs very numerous, vertical: spines most abundant towards the apex, unequal, spreading, stout, whitish; the 3 upper radials and solitary central strong, the others (especially the lowest) small: flowers purple, with whitish margin. Mexico.—The name was suggested by the appearance of the terminal cluster of flowers surrounded by a fortification of strong spines.

30. **crispàtus,** DC. (*E. dírigens*, Link). Globose, 5 in. or more high: ribs 30–60, compressed and sharp, more or less undulate-crisped: spines 7–11, widely spreading, more or less flattened, the upper larger and brown at tip, the lower shorter and white, or all of them brown: flowers purple, or white with purple stripes. Mexico and Central America.

CCCC. *Tuberculate, as in Mammillaria.*

31. **hexædróphorus,** Lem. More or less globular, dark gray: ribs deeply tuberculate, giving the appearance of a Mammillaria, with hexagonal tubercles: radial spines 6 or 7, radiating like a star; central spine solitary, erect, longer; all the spines annulate, reddish brown: flowers white, tinted with rose. Mexico.

32. **lopothèle,** Salm-Dyck. Globose, strongly tuberculate, after the manner of Mammillaria: tubercles quadrangular, bearing clusters of 5–10, more or less porrect, long, rigid, and equal spines; central solitary or wanting: flowers white or yellowish. Mexico.

BBB. *Central spines 4 (2 or 3 in Sileri and sometimes 3 in Scopa).*

C. *Ribs less than 13.*

33. **robústus,** Otto. Clavate and stout: ribs about 8, compressed, vertical· radial spines about 14, the upper ones slender, the lowest 3 stronger; central spines 4, 4-angled at base, transversely striate, the lowest one largest; all the spines purple-red, 1½–3 in. long: flowers golden yellow. Mexico.

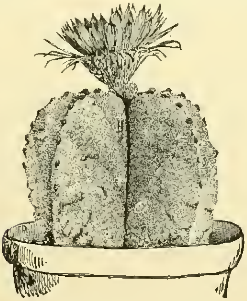
34. **Ottònis,** Link & Otto. Depressed-globose or ovate, 3–4 in. high: ribs 10–12, obtuse: radial spines 10–18, slender, yellowish, more or less straight and spreading, about ½ in. long; central spines 4, dusky red, stronger, the uppermost very short, the two laterals horizontal, the lowest longest (1 in.) and deflexed: flowers lemon-yellow, becoming 2–3 in. in diameter. Mexico.

35. **bícolor,** Gal. Globose-ovate, stout, 1½–4 in. in diam., sometimes becoming 8 in. high: ribs 8, oblique and obtuse, compressed, tuberculate-interrupted: lower radials and centrals variegated red and white; radials 9–17, spreading and recurved, slender and rather rigid, the lowest one ½–1 in. long, the laterals 1–2 in. long and about equaling the 2–4 flat flexuous ashy upper ones; centrals 4, flat and flexuous, 1½–3 in. long, the uppermost thin and not longer than the erect and rigid laterals, the lowest very stout, porrect and very long: flowers funnelform, bright purple, 2–3 in. long. Northern Mexico.

CC. *Ribs 13–27.*

36. **orthacánthus,** Link & Otto. (*E. flavovirens*, Scheidw.). Globose, yellowish green: ribs 12 or 13, vertical, acute: radial spines 14, unequal, straight and spreading; central spines 4, stronger, the lowest the largest; all the spines rigid, annulate, and grayish white. Mexico.

37. **intertéxtus,** Engelm. Ovate-globose, 1–4 in. high: ribs 13, acute, somewhat oblique, tuberculate-interrupted, the tubercles with a woolly groove: spines short and rigid, reddish from a whitish base and with dusky tips; radial 16–25, closely appressed and interwoven, the upper 5 to 9 setaceous and white, straight, one-fifth to ½ in. long, the laterals more rigid and a little longer, the lowest stout and short, a little recurved; centrals 4, the 3 upper ones turned upward and exceeding the radials and interwoven with them, the lower one very short, stout and porrect: flowers about 1 in. long and wide, purplish. Texas and northern Mexico.



746. Echinocactus myriostigma.

38. **Órcuttii,** Engelm. Cylindrical, 2–3½ ft. high, 1 ft. in diam., single or in clusters up to 18 or more, not rarely decumbent: ribs 18–22, often oblique: spines extremely variable, angled to flat, ¼–3 in. wide; radials 11–13, unequal, lowest and several laterals thinnest; centrals 4: flowers about 2 in. long, deep crimson in center, bordered by light greenish yellow. Lower California.

39. **Jóhnsoni,** Parry. Oval, 4–6 in. high: ribs 17–21, low, rounded, tuberculately interrupted, close set, often oblique, densely covered with stoutish reddish gray spines: radial spines 10–14, three-fifths to one and one-third in. long, the upper longest; centrals 4, stouter, recurved, about 1½ in. long: flowers 2 to two and three-fifths in. long and wide, from deep red to pink. Utah, Nevada, California.

40. **polycéphalus,** Engelm. & Bigel. Globose (6–10 in. in diam.) to ovate (10–16 in. high, 5–10 in. in diam.) and cylindrical (reaching 24–28 in. high and about 10 in. in

diam.), profusely branched at base: ribs 13–21 (occasionally 10): spines 8–15, very stout and compressed, more or less recurved and reddish; radials 4–11, comparatively slender (the uppermost the most slender), 1–2 in. long; the 4 centrals much stouter and longer (1½ to two and four-fifths in.), very unequal, the uppermost one usually broadest and curved upward, the lowest one usually the longest and decurved: flowers yellow. From Utah to northern Mexico.

41. **viridéscens,** Nutt. Globose or depressed, simple or branching at base, 4–12 in. high, 6–10 in. in diam.: ribs 13–21 (fewer when young), compressed and scarcely tuberculate: spines more or less curved and sometimes twisted, reddish below, shading into greenish or yellowish above; radials 9–20, two-fifths to four-fifths in. long, the lowest shortest, robust, and decurved; centrals 4, cruciate, much stouter, compressed and 4-angled, four-fifths to one and two-fifths in. long, the lowest broadest, longest and straightest: flowers yellowish green, about one and three-fifths in. long. Southern California.

42. **Lecóntei,** Engelm. Resembles Wislizeni, but often somewhat taller (sometimes becoming 8 ft. high and 2 ft. in diam.), usually more slender, and at last clavate from a slender base: ribs somewhat more interrupted and more obtuse: lower central spine more flattened and broader, curved (rather than hooked) or twisted, usually not at all hooked, sometimes as much as 6 in. long: flower rather smaller. From the Great Basin to Mexico and Lower California.

43. **Sileri,** Engelm. Globose: ribs 13, prominent, densely crowded, with short rhombic-angled tubercles: radial spines 11–13, white; centrals 3, black, with pale base, three-fifths in. long, the upper one slightly longer: flower scarcely 1 in. long, straw-colored. Utah.

44. **Grùsoni,** Hildmann. Globose, completely covered by a mass of almost transparent golden spines, which give the plant the appearance of a ball of gold; centrals 4, curved: flowers red and yellow. Mountains of Mexico. —From illustrations it is evident that the radial spines are somewhat numerous and widely spreading, and that the centrals are prominent and more or less deflexed.

45. **Saltillénsis,** Poselg. Very stout, globose: ribs 15–19, compressed, dark green: spines very prominent, 5–7 in a cluster, stout and porrect, sometimes becoming 5 in. long; centrals 4. Mexico.—Schumann makes this a variety of *E. ingens*.

746*a*. Mammillaria macromeris. For comparison with Echinocacti.

CCC. *Ribs 30 or more.*

46. **Scòpa,** Link & Otto. More or less cylindrical, 1 ft. or more high, 2–4 in. in diameter, at length branching above: ribs 30–36, nearly vertical, tuberculate; radial spines 30–40, setaceous, white; central spines 3 or 4, purple, erect; sometimes all the spines are white: flowers yellow. Brazil.—The species is exceedingly plastic in form, branching variously or passing into the cristate condition.

BBBB. *Central spines 5–10.*

47. **pilòsus,** Gal. Globose, 6–18 in. high: ribs 13–18, compressed, little if at all interrupted: radial spines represented by 3 slender ones at the lowest part of the pulvillus or wanting; centrals 6, very stout, at first purplish, becoming pale yellow, the 3 upper ones erect, the 3 lower recurved-spreading: flowers unknown. Northern Mexico.

48. **Simpsoni,** Engelm. Subglobose or depressed, turbinate at base, simple, often clustered, three and one-fifth to five in. in diam.: ribs 8–13, only indicated by the spiral arrangement of the prominent tubercles, which are ½ to three-fifths in. long, somewhat quadrangular at base and cylindric above: exterior spines 20–30, slender, rigid, straight, whitish, ⅓–½ in. long, with 2–5 additional short setaceous ones above; interior spines 8–10, stouter, yellowish and reddish brown or black above, erect-spreading, two-fifths to three-fifths in. long; no truly central spine: flowers three-fifths to four-fifths in. long and nearly as broad, yellowish-green to pale purple. Mountains of Colorado, Utah and Nevada.

AAA. *Spines entirely wanting.*

49. **turbinifórmis,** Pfeiff. Depressed-globose, grayish green, with 12–14 spirally ascending ribs, cut into regular rhomboidal tubercles; tubercles flat, with a depressed pulvillus, entirely naked excepting a few small setaceous spines upon the younger ones: flowers white, with a purplish base. Mexico.—The depressed and spineless body, with its surface regularly cut in spiral series of low, flat tubercles, gives the plant a very characteristic appearance.

50. **myriostígmus.** Salm-Dyck (*Astrophỳtum myriostigma*, Lem.). Fig. 746. Depressed-globose, 5 in. in diam.: ribs 5 or 6, very broad, covered with numerous somewhat pilose white spots, and with deep obtuse sinuses: spines none: flowers large, pale yellow. Mexico.

51. **Wílliamsii,** Lem. (*Anhalònium Williamsii*, Lem. *Lophóphora Williamsii*, Coult.). Hemispherical, from a very thick root, often densely proliferous, transversely lined below by the remains of withered tubercles: ribs usually 8 (in young specimens often 6), very broad, gradually merging above into the distinct nascent tubercles, which are crowned with somewhat delicate penicillate tufts, which become rather inconspicuous pulvilli on the ribs: flowers small, whitish to rose. Texas and Mexico.—The well-known "mescal button," used by the Indians in religious rites.

52. **Lewínii,** Hennings (*Anhalònium Lewinii*, Hennings. *Lophóphora Lewinii*, Coult.). Like *E. Williamsii*, but a much more robust form, with more numerous (usually 13) and hence narrower and more sinuous ribs, and much more prominent tufts. Along the Rio Grande.

John M. Coulter.

Other names of Echinocacti may be looked for under Echinocereus and Mammillaria. Echinocactus and Mammillaria are distinguished chiefly by the way in which the fls. are borne,—terminal on the tubercles in the former, and axillary to tubercles or ribs in the latter. In external appearance they are very similar. Some species may be referred to either genus or to both. *Mammillaria micromeris* (Fig. 302) is considered by some to be an Echinocactus. The strong resemblances between these two genera may be seen by comparing the Echinocacti in Figs. 745 and 746 with the Mammillaria in Fig. 746*a*. See, also, Figs. 1355–7 under Mammillaria.

ECHINOCÈREUS (*spiny Cereus*). *Cactàceæ.* Stems usually low and growing in thick clusters, which sometimes reach a considerable size: fls., as a rule, mostly short funnel-form: ovary and tube covered with bracts, from the axils of which are produced to a greater or less extent wool, bristles and spines: fr. globose to ellipsoidal, covered with spines until ripe. The genus is so closely allied to Cereus, and merges so gradually into it, that it seems impossible to draw a sharp line of distinction between them, and, indeed, by some authors they are combined under Cereus. For culture, see *Cactus*, *Cereus*, and *Echinocactus*.

INDEX

acifer, 19.
adustus, 24.
Berlandieri, 3.
Blankii, 4.
cæspitosus, 24.
chloranthus, 20.
chrysocentrus, 13.
coccineus, 17.
conglomeratus, 14.
conoideus, 17.
ctenoides, 23.
dasyacanthus, 22.
dubius, 7.
Engelmannii, 13.
enneacanthus, 6.
Fendleri, 12.
gonacanthus, 9.
longisetus, 10.
Merkeri, 8.
Mojavensis, 16.
paucispinus, 9.
pectinatus, 24.
phœniceus, 17.
polyacanthus, 18.
procumbens, 5.
rigidissimus, 24.
Rœtteri, 11.
rufispinus, 24.
Scheeri, 2.
stramineus, 15.
triglochidiatus, 9.
tuberosus, 1.
variegatus, 13.
viridiflorus, 21.

A. *Stems small, slender, cylindrical, much resembling Cereus.*

1. **tuberòsus,** Rümpl. (*Cereus tuberòsus*, Poselg.). Stems cylindrical, upright, or later reclining, clustered, from a number of more or less globular or ellipsoidal tuberous roots, the lower part woody and about the size of a lead pencil, the upper part more fleshy, about ½in. in diam., reaching a length of 1–2 ft.: ribs about 8, straight, low, rounded: areolæ very close together: radial spines 9–12, horizontally spreading, straight, white, thin subulate, very short; central solitary, subulate, from a tuberous base, about twice the length of the radials, white or brownish, with darker brown or black tips, directed upward, appressed: fls. from the end of the stem, about 2 in. long, tube covered with an abundance of white wool intermingled with bristles, rose-red to purplish: fr. ovoid, green, covered with the white wool and bristles. Tex. and northern Mex.

AA. *Stems prostrate, sometimes the branches upright when young, mostly less than 1 in. in diam.*

2. **Scheèri,** Lem. (*Cereus Scheèri*, Salm-Dyck). Branching freely from the base of the stem and forming dense clusters; branches upright or ascending, about 8 in. long by 1 in. in diam., slightly tapering toward the apex, dark green: ribs 8–9, straight or sometimes inclined to spiral, separated above by sharp grooves, which become flattened toward the base, low arched: areolæ little more than ¼in. apart, round, yellowish white: radial spines 7–9, spreading, needle-like, the under pair the longest, about ¼–⅜in. long, white with yellowish bases; centrals 3, the lower the longest, about ⅜in., red with brown bases; later all the spines become gray: fl. red, from the upper part of the stem, about 5 in. long: ovary and tube bracteate and furnished with abundance of wool and spines. Mex.

3. **Berlandièri,** Lem. (*Cereus Berlandièri*, Engelm.). Stems prostrate, richly branching, forming dense clusters, the branches upright or ascending, 2–3 in. long or longer by ½–¾ in. in diam., light or dark green, and in young growth often purplish: ribs 5–6, broken up into as many straight or spiral rows of tubercles, tubercles conical, pointed: areolæ ⅜–⅝ in. apart, round, white-woolly, soon naked: radial spines 6–8, stiff bristle-form, thin, horizontally spreading, white, about ⅜ in. long, the upper one sometimes light brown and somewhat stronger; central solitary, yellowish brown, sometimes reaching ¾ in. in length: fls. from the upper lateral areolæ, 2–3 in. long, red to light pink: fr. ovoid, green, bristly. Southern Tex. and northern Mex.

4. **Blánkii,** Palm. (*Cereus Blánkii*, Poselg.). Branching freely from the base and thus forming clusters: stems columnar, tapering above, about 6 in. long by 1 in. in diam., dark green: ribs 5–6 (rarely 7), straight, almost divided into tubercles: areolæ about ⅜ in. apart, round, white curly-woolly, later naked: radial spines mostly 8, horizontally spreading, the under pair the longest, reaching about ⅜ in. in length, all stiff, straight, thin, white or the upper ones carmine-red when young, later reddish brown; central solitary, porrect, later deflexed, 1–1¼ in. long, white or brownish, black when young: fls. from near the crown, 2½–3 in. long, purple-red to violet. Mex. R.H. 1865:90.

5. **procúmbens,** Lem. (*Cereus procúmbens*, Engelm.). Branching from the lower part of the stem, and so forming clusters: branches procumbent or ascending, angled, at the base tapering into cylindrical, 1½–5 in. long by ½–¾ in. in diam.: ribs mostly 5, rarely 4, straight or spiral, on the upper portion of the branch almost divided into tubercles: areolæ ¼–½ in. apart, round, sparingly white curly-woolly, soon naked: radial spines 4–6, subulate, stiff, straight, sharp, in young growth brownish, then white, at the base often yellowish and the tip brownish, horizontally spreading, the upper the longest, reaching ¼ in. in length; central solitary, or absent on the lower areolæ, somewhat stronger, ⅜–⅝ in. long, darker: fls. lateral, from just below the crown, 3–4 in. long, carmine-red to violet, with white or yellowish throat: fr. ellipsoidal, green, ⅝ in. long. Mex.

6. **enneacánthus,** Engelm. (*Cereus enneacánthus*, Engelm.). Freely branching at the base of the stem, and thus forming thick, irregular clusters: branches ascending, usually 3–5 in. long by 1½–2 in. in diam., green or sometimes reddish: ribs 8–10, straight, often divided by transverse grooves into more or less conspicuous tubercles: areolæ ⅜–⅝ in. apart, round, white curly-woolly, soon naked: radial spines 7–12 (mostly 8), horizontally spreading, needle-form, straight, stiff, translucent white, base bulbose, the under one longest, reaching about ½in., the upper one very short; central solitary, or seldom with two additional upper ones, straight, porrect or deflexed, round or angled, whitish to straw-yellow or darker, ⅜–1½ in. long; later all the spines are gray: fls. lateral, from near the crown or lower, 1¾–2½ in. long, red to purplish: fr. spherical, green to red, spiny, ¾–1 in. long. Tex. and northern Mex.

AAA. *Stems erect, more than 1 in. in diameter.*

B. *Ribs of stem 9 or less.*

7. **dùbius,** Rümpl. (*Cereus dùbius*, Engelm.). Tolerably thickly clustered; stems branching at the base, cylindrical or elongated ellipsoidal, 4½–7 in. high by 1½–2¼ in. in diam.: ribs 7–9, undulate: areolæ ⅜–⅝ in. apart, round, covered with short curly white wool, later naked: radials 5–8, subulate, horizontally spreading, stiff, round or faintly angled, the lower ones usually the longest, about 1 in. long, the upper ones about half as long, or sometimes absent, transparent white; centrals 1–4, stronger and longer, bulbose at the base, straight or curved, reaches 2½ in. in length, the lowest one longest, straight, porrect or deflexed, the upper ones spreading: fls. lateral, 2 in. long, rose-red to violet: fr. spherical, greenish to purple-red, covered with bundles of deciduous spines. Tex. and northern Mex.

8. **Mérkeri,** Hildm. Stems at first upright, columnar, later reclining, and by branching at the base forming clusters, in new growth bright green, later gray to gray-brown and corky: ribs 5–9, undulate to more or less tuberculate: areolæ ¾in. and more apart, round, white velvety, later naked: radial spines 6–9, the upper ones the longest, reaching 1¼ in. in length, somewhat confluent with the centrals, subulate, spreading, straight; centrals 1–2, stronger, reaching a length of 2 in.; all the spines are white, nearly transparent, with red-tinted bulbose base. Northern Mex.

9. **paucispìnus,** Rümpl. (*Cereus paucispìnus*, Engelm.). Clustered in irregular bunches: stems cylindrical to ovoid, 4–7 in. high by 1¾–3 in. in diam.: ribs 5–7, undulate: areolæ ⅜–⅝ in. apart, round, white woolly, later naked: radial spines 3–6, spreading, subulate, straight or curved, round, bulbose at the base, the lowest one longest, reaching ¾ in., light colored, the upper ones reaching to about ½ in., reddish or brownish; central solitary or none, reaching about 1½ in. in length, somewhat angled, brown-black, porrect or upright; later all the spines blackish: fls. 2 in. or more long, dark scarlet to yellowish. Tex. and Colo.

Var. **triglochidiàtus**, K. Sch. (*Echinocereus triglochidiàtus*, Engelm. *Cereus triglochidiàtus*, Engelm.). Radial spines usually 3, sometimes as many as 6, strong, angled, base bulbose, straight or curved, about 1 in. long, soon ash-gray. Tex. and New Mex.

Var. **gonacánthus**, K. Sch. (*Echinocereus gonacánthus*, Lem. *Cereus gonacánthus*, Engelm. and Bigel.). Radial spines 8, very large, angled and sometimes twisted, the upper strongest, reaching nearly 3 in. in length, light or dark yellow with brown tips; central always present, deeply grooved, often flattened, 3 in. or more long. Colo.

BB. *Ribs of stem about 9–13.*

10. **longisètus**, Lem. (*Cereus longisètus*, Engelm.). Stems clustered, cylindrical, covered with long, dirty white spines, about 8 in. high by 2 in. in diam., light green: ribs 11–14, straight, undulate: radial spines 18-20, straight, compressed, base thickened, subulate, flexuose, usually horizontally spreading, interlocking with adjacent clusters, the lower laterals the longest, reaching ⅜in. in length, the upper more bristle-like and the shortest, all white; centrals 5–7, longer, reaching 2½ in., stronger, the upper ones scarcely longer than the longest radials; all are bulbose at the base; the three lower ones the longest and deflexed, spreading and sometimes curved: fls. red. Mex.

11. **Rœ́tteri**, Rümpl. (*Cereus Rœ́tteri*, Engelm.). Loosely open clustered: stems upright, 4–6 in. high, 2–3 in. in diam., cylindrical or ovoid: ribs 10–13, straight: radial spines 8–15, subulate, thickened at the base, stiff, sharp, straight or slightly curved, the laterals longest, about ½ in., the upper ones shortest, reddish with darker tips; centrals 2–5, stouter, bulbose at base, ¼–⅜in. long, the lower ones the longest; later all the spines are gray: fls. lateral, from near the crown, 2½–3 in. long, purple-red to violet: fr. short ellipsoidal, spiny, green, ¾in. long. Tex. to Ariz. and northern Mex.

12. **Féndleri**, Rümpl. (*Cereus Féndleri*, Engelm.) Irregularly clustered: stem cylindrical or rarely ovoid or even globose, sparingly branching, 3–7 in. high by 1¾–2½ inch in diam.: ribs 9–12, straight or slightly spiral, undulate: radial spines 7–10, subulate, straight or curved, the lowest or the two lower laterals the longest, about 1 in., stronger, quadrangular, white; the two next higher brownish; the upper ones round, white and much shorter; all are bulbose at the base; central solitary (or in old plants 3–4), very strongly thickened at the base, round, black, sometimes with a lighter colored tip, curved upward, reaching a length of 1¾ in.: fls. lateral, from near the crown, 2–3½ in. long, dark carmine-red to purple and violet: fr. ellipsoidal, spiny, green to purple-red, about 1 in. long. Colo., Utah and south to northern Mex. B.M. 6533.

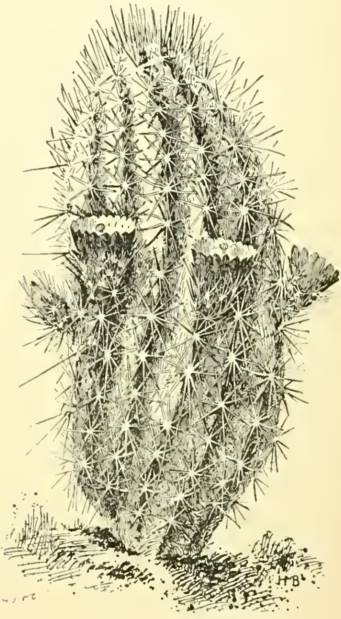
13. **Éngelmannii**, Lem. (*Cereus Engelmannii*, Parry). Stems clustered, cylindrical to ovoid, 4–10 in. high, 1¾–2½ in. in diam., light green: ribs 11–13, undulate: radial spines 11–13, somewhat angled, stiff, sharp, straight or somewhat curved, horizontally spreading, the lowest or lower laterals the longest, about ½ in., the upper ones the shortest, whitish with brown tips; centrals 4, stiff, straight, angled, stout, the lowest one deflexed, white to dark-colored, reaching a length of 2½in., the upper ones about ½ as long, spreading, brown: fls. lateral, from just below the crown, 1¾–2½ in. long, purple-red: fr. ovoid, green to purple-red, spiny, later naked, about 1 in. in diam.; pulp purple-red. Calif. to Utah and south into Mex.

Var. **chrysocéntrus**, Engelm. and Bigel. The three upper centrals golden yellow, the lowest white. Mojave desert, Calif.

Var. **variegàtus**, Engelm. and Bigel. The three upper centrals curved, horn-colored and mottled with black. Utah, Nev. and Calif.

14. **conglomeràtus**, Först. Stems clustered, columnar, somewhat tapering above, reaching a height of 1 ft. and 2 in. in diam., light green: ribs 12–13, strongly undulate, tubercled above: radial spines 9–10, glossy, spreading, the lower pair the longest, base yellow; centrals 1–4, the lowest straight, porrect, reaching a length of 1½ in. and more, somewhat stronger than the rest. Northern Mex.

15. **stramineus**, Rümpl. (*Cereus stramineus*, Engelmann). Clustered in thick, irregular bunches: stems ovoid to cylindrical, 4–8 in. long, 1½–2½ in. in diam.: ribs 11–13: radial spines 7–10 (usually 8), horizontally radiate, straight or slightly curved, subulate, sharp, round or the long lower ones angled, transparent white, tolerably equal in length, about ½–¾ in. or the lower ones sometimes longer and reaching a length of 1½ in.; centrals 3–4, much longer, stronger, twisted, angled, straw yellow to brownish, when young reddish transparent, the upper ones shortest and spreading upward, the lower ones porrect or depressed: fls. lateral, 2½–3½ in. long, bright purple-red or deep dark red to scarlet: fr. ellipsoidal, about 1½ in. long, covered with numerous spines, purple-red. Tex. to Ariz. and northern Mex.



747. Echinocereus chloranthus.

16. **Mojavénsis**, Rümpl. (*Cereus Mojavénsis*, Engelm. and Bigel.). Stems clustered, ovoid, reaching 3 in. in height by 2 in. in diam.: ribs 8–12, conspicuously undulate: radial spines 5–8, the lowest pair the longest, reaching about 2¼ in. in length; all are white with brown tips, subulate, straight or curved, strongly bulbose at the base; central solitary, or sometimes absent, stronger and somewhat longer and darker colored; later all the spines become gray: fls. 2–3 in. long, deep carmine: fr. ellipsoidal, about 1 in. long. Mojave desert of Ariz., Nev. and Calif.

17. **phœníceus**, Lem. (*Echinocereus coccíneus*, Engelm. *Cereus phœníceus*, Engelm.). Stems irregularly clustered, ellipsoidal to short cylindrical, 2–4 in. high by 1½–2¼ in. in diam.: ribs 8–11, straight: spines bristle-form, straight, round; radials 8-12, white, ¼–½ in. long, upper ones shortest; centrals 1–4, stouter, white to yellow or brown, with bulbose base: fls. from upper lateral areolæ scarlet-red, with the corolla throat yellow. Colo. to Ariz.

Var. **conoideus**, Engelm. (*Echinocereus conoideus*, Rümpl. *Cereus conoideus*, Engelm.). Central spine long and robust: fls. large, red. Southern Calif. and northwest Mex.

18. **polyacánthus**, Engelm. (*Cereus polyacánthus*, Engelm.). Stems clustered, forming thick masses, cylindrical to ellipsoidal: ribs 9–13: radial spines 8–12, robust, subulate, stiff and sharp, under one the longest, nearly 1 in., upper ones scarcely ⅓ in., white to reddish gray with dark tips; centrals 3–4, bulbose base, stronger, about the length of the radials or the lowest sometimes reaching 2 in., horn-colored; later all the spines become gray: fls. lateral, about 1¾–2¼ in. long, dark scarlet to blood-red: fr. spherical, about 1 in. long, greenish red, spiny. Tex. to Calif. and northern Mex.

19. **ácifer**, Lem. (*Cereus ácifer*, Otto). Stems thickly clustered, 6–8 in. high by 1½–2 in. in diam., becoming gray and corky with age: ribs 9–11, usually 10: radial spines usually 9, spreading, under pair longest, about ½ in., in young growth white, later horn-colored to gray, the upper ones brownish; central solitary, straight, porrect, at first ruby red, later brown, 1 in. long: fls. lateral, 2 in. and more long, clear scarlet-red, with a yellow throat and sometimes a carmine border. Northern Mex.

BBB. *Ribs of stem 13 or more.*

20. **chloránthus**, Rümpl. (*Cereus chloránthus*, Engelm.). Fig. 747. Stems in small clusters, cylindrical, slightly tapering above, 4–9 in. high by 2–2½ in. in diam.: ribs 13–18, straight or rarely spiral: radial spines 12–20, horizontally spreading and appressed, sharp, the shortest one about ⅜in. long and white, the lower laterals a little longer and have purple tips; centrals 3–5, or in young plants absent, bulbose at the base, the upper ones shortest, about the length of the radials, and darker colored, with purplish tips, the lower ones stouter, about 1 in. long, deflexed, white; frequently all the spines are white: fls. lateral, little more than 1 in. long: ovary and tube white bristly; petals green: fr. ellipsoidal, about ½in. long, spiny. Texas and New Mexico.

21. **viridiflòrus**, Engelm. (*Cereus viridiflòrus*, Engelm.). Stems solitary or only in age forming small, loose clusters, cylindrical or elongated ellipsoidal, 3–7 in. high by 1–2 in. in diam.: ribs 13: radial spines 12–18, horizontally radiate, pectinate, straight or somewhat curved, subulate, the lower laterals the longest, about ½ in., translucent ruby red, the others white; centrals usually absent, rarely 1, strong, about ¾ in. long, curved upward, red with brown point: fls. lateral, from just below the crown, broad funnel-form, little more than 1 in. long: ovary and tube spiny: corolla green, with a broad darker olive green to pink stripe down the middle of each petal: fr. ellipsoidal, about ¼ in. long, greenish. Wyo. and Kans. to Tex. and New Mex.

22. **dasyacánthus**, Engelm. (*Cereus dasyacánthus*, Engelm.). Stems solitary or sometimes forming open clusters, ellipsoidal to short cylindrical: ribs 15–21, straight or sometimes slightly spiral, obtuse: radial spines 20–30, straight or sometimes slightly curved, subulate, stiff, sharp, pectinate, white with red or brown tips, later gray, the laterals longest, ½–1 in., the upper ones shortest, about ⅜ in., those of one cluster interlocking with those of the adjacent clusters; centrals 3–8, the lower one longest, white with colored tips, mostly with bulbose bases: fls. from near the crown of the stem, large, 2½–3 in. long: ovary and short tube covered with white, reddish tipped stiff bristles; corolla yellow: fr. 1–1½ in. long, ellipsoidal, spiny, green to reddish. Tex.

23. **ctenoides**, Lem. (*Cereus ctenoides*, Engelm.). Stems solitary or rarely branching, cylindrical to elongated ovoid, reaching a height of 6 in. and a diam. of 2½ in.: ribs 15–16, usually straight: radial spines 13–22, horizontally radiate, pectinate, subulate, bases bulbose and laterally compressed, stiff, straight or often slightly curved, the laterals longest and about ⅜ in., the upper ones very short, white or sometimes with brownish tips; centrals 2–3 or rarely 4, superposed, coarser, bulbose at the base, short and conical to ¼ in. long, reddish; later all the spines are gray: fls. lateral, from near the crown, 2½–3 in. long: ovary and short tube white bristly: corolla yellow, with greenish throat. Tex. and northern Mex.

24. **pectinàtus**, Engelm. (*Cereus pectinàtus*, Engelm.). Clustered stems cylindrical or ovoid, reaching a height of 10 in. by 3 in. diam.: ribs 13–23, straight: radial spines 16–30, pectinate, horizontally spreading and appressed, straight or curved, the laterals longest, round, hardly ⅜ in. long; central usually absent, or as many as 5, which are short, conical and superposed, white, with tips and bases variously colored with pink, yellow or brown; later all become gray: fls. lateral, from near the crown, 2½–4 in. long: ovary tuberculate and spiny, light to dark rose-red or rarely white: fr. globose, spiny, green to reddish green. Mex.

Var. **adústus**, K. Sch. (*Cereus adústus*, Engelm.). Like the type, but with black-brown to chestnut-brown spines. Mex.

Var. **rigidíssimus**, Engelm. (*Cereus cándicans*, Hort. *C. rigidíssimus*, Hort.). Rainbow Cactus. Fig. 748. Stems comparatively shorter and thicker: radial spines 16–20, coarser and stiffer, straight or very little curved; base thickened, white, yellow or red to brown, these colors commonly arranged in alternating bands around the plant, the spines of adjacent clusters interlocking; centrals absent. Tex. to Ariz. and northern Mex.

748. Echinocereus pectinata, var. rigidissimus.

Var. **cæspitòsus**, K. Sch. (*Echinocereus cæspitòsus*, Engelm. *Cereus cæspitòsus*, Engelm.). Radials 20–30, curved, clear white or with rose-red tips; centrals absent, or 1–2 very short ones. Indian Terr., Tex. and Mex.

Var. **rufispinus**, K. Sch. Of more robust growth: radial spines curved, red. Mex.

Horticultural names unidentified: *E. polycéphalus.—E. sanguíneus.—E. Uehri.—E. Uspénskii.—E. paucupìna*, no doubt a mutilation of paucispinus.—*E. Schlini*=E. Scheeri?

C. H. Thompson.

ECHINOCÝSTIS (Greek, *hedge-hog* and *bladder;* from the prickly fruit). *Cucurbitàceæ.* Wild Cucumber. Wild Balsam-Apple. This genus contains a hardy native annual vine which is a great favorite for home arbors, although not especially beautiful in foliage, flower or fruit. Its bladdery fruits about 2 in. long, covered with weak prickles, are a source of unfailing delight to children, who love to make them burst. It is one of the quickest growing of all vines, and is therefore useful in hiding unsightly objects, while the slower-growing shrubbery is getting a start. The latest reviewer of the gourd family (Cogniaux, in DC. Mon. Phan. vol. 3, 1881) makes three sections of this genus, and this plant the sole representative of the second section, or true Echinocystis, because its juicy fruit bursts irregularly at the top, and contains 2 cells, each with 2 flattish seeds.

lobàta, Torr. & Gray. Lvs. wider than long, deeply 5-lobed, slightly emarginate at the base: tendrils 3–4-branched: staminate fls. small, in many-fld. panicles longer than the lvs.; calyx glabrous: fr. egg-shaped, sparsely covered with prickles. Saskatchewan to Winnepeg, south to Va. and Ky., west to Colo. A.G. 14:161. R.H. 1895, p. 9. G.C. III., 22:271. Sometimes becomes a weed.
W. M.

ECHÌNOPS (Greek, *like a hedgehog;* alluding to the spiny involucral scales). *Compósitæ.* GLOBE THISTLE. A large genus of thistle-like plants, with blue or whitish flowers in globose masses. The structure of one of these globes is very curious. Each flower in the globe has a little involucre of its own, and the whole globe has one all-embracing involucre. Another way of saying the same thing is "heads 1-fld., crowded into head-like glomes." More or less white-woolly herbs: lvs. alternate, pinnate-dentate or twice or thrice pinnatisect, the lobes and teeth prickly.

Globe Thistles are coarse-growing plants of the easiest culture, and are suitable for naturalizing in wild gardens and shrubberies. An English gardener with an eye for the picturesque (W. Goldring) recommends massing them against a background of *Bocconia cordata*, or with such boldly contrasting yellow- or white-flowered plants as *Helianthus rigidum* or *Helianthus multiflorus.* The best species is *E. Ruthenicus.* A few scattered individuals of each species are not nearly so effective as a condensed mass or group of one kind. *E. Ruthenicus* flowers in midsummer and for several weeks thereafter. The silvery white stems and handsomely cut prickly foliage of Globe Thistles are interesting features. They make excellent companions for the blue-stemmed Eryngiums. All these plants are attractive to bees, especially *E. exaltatus*, which has considerable fame as a bee-plant. Globe Thistles are sometimes used abroad for perpetual bouquets.

A. *Leaves not pubescent nor setulose above.*

Rìtro, Linn. Tall, thistle-like plant, with pinnate-lobed lvs., which (like the stems) are tomentose beneath, the lobes lanceolate or linear and cut, but not spiny: involucre scales setiform, the inner ones much shorter: fls. blue, very variable. Var. **tenuifòlius,** DC. (*E. Ruthénicus*, Hort.) has the lower leaves more narrowly cut, more or less spine-tipped. Gn. 45:951.—Perennials of S. Eu., growing 2–3 ft. high. They bloom all summer. Lvs. sometimes loosely webby above.

AA. *Leaves pubescent or setulose above.*

Bannáticus, Rochel. Lvs. hairy-pubescent above, tomentose beneath (as also the stems), the lower ones deeply pinnately parted, the upper pinnatifid, spiny: fls. blue. Hungary. R.H. 1858, p. 519.

exaltàtus, Schrad. Tall biennial, the stem nearly simple and glandulose-pilose, the lvs. pinnatifid, scarcely spiny: fls. blue. Russia. B.M. 2457 as *E. strictus*, Fisch. Distinguished by its simple, erect stem. The garden *E. commutàtus* may be the same as this.

sphærocéphalus, Linn. Tall (5–7 ft.) perennial: lvs. pinnatifid, viscose-pubescent above, tomentose below, the teeth of the broad lobes yellow-spined: fls. white or bluish. S. Eu. B.R. 5:356.
L. H. B.

ECHINÓPSIS (Greek, *hedgehog-like*). *Cactàceæ.* SEA-URCHIN CACTUS. Stems spherical to ellipsoidal or rarely columnar: ribs prominent and usually sharp-angled: fls. usually long trumpet-shaped, ovary and tube covered with linear-lanceolate, cuspidate bracts which become longer toward the outer end of the tube, where they pass gradually into the outer petals, in their axils bearing long, silky, wavy hairs and usually a few rather rigid bristles. This is a well marked genus, though by some authors combined with Cereus, confined entirely to South America. Culture as for Cereus.

A. *Ribs of stem divided into more or less evident tubercles.*

Péntlandii, Salm-Dyck. Stem simple, later branching, spherical or ellipsoidal, reaching 6 in. in diam.: ribs 12–15, divided between the areolæ into oblique compressed tubercles: radial spines 9–12, spreading, straight or slightly curved, yellowish brown, the upper the longest and strongest, reaching ½–1¼ in.; central solitary, or seldom in pairs, porrect, curved, 1–1½ in., rarely 3 in. long: fls. lateral, 2–2½ in. long, yellow, orange, pink to scarlet-red: fr. spherical, green, ¾ in. in diam. Peru. B.M. 4124.

AA. *Ribs of stem not divided.*

B. *Flowers red or pink.*

múltiplex, Zucc. Stems at first rather clavate, later globose to ellipsoidal, abundantly branching, 6–12 in. in diam. and the same in height, or rarely taller, light green to yellowish: ribs 12–14, straight, scarcely undulate: radial spines about 10, subulate, straight, yellow to yellowish brown, with darker tips, reaching ¾ in. in length, very unequal, horizontally spreading; centrals mostly 4, of these the lowest is the longest, reaching 1½ in., somewhat porrect at first, later curved and deflexed, darker colored than the others: fls. rare, lateral, 11–15 in., rose-red. S. Braz. B.M. 3789.

Var. **cristàta,** Hort. Stems flat and spreading in growth, like an open fan or the flower stalk of the common garden cockscomb, spines reduced to fine, stiff bristles. This is merely a montrosity of the species.

oxýgona, Zucc. Stems at first simple, nearly spherical or rarely clavate, becoming short columnar, reaching 1½ ft. in height and 1 ft. in diam., gray-green, darker above: ribs 13–15, straight or wavy at the base: radial spines 5–15, horizontally spreading, very unequal, reaching ⅝ in., subulate, obliquely upright; centrals 2–5, somewhat longer, straight, porrect or deflexed, dark horn-colored, with black tips: fls. commonly many together, lateral, reaching 13 in. in length, pink to carmine-red, the inner petals lighter than the outer ones. S. Braz.

triúmphans, Jacobi. This is a hybrid between *E. Eyriesii* and *oxygona*, with pink double flowers.

BB. *Flowers white.*

Eyrièsii, Zucc. Stem simple, commonly branching later, at first somewhat depressed, later short to rather tall columnar, reaching a height of 2 ft. and a diam. of 4–6 in., dark green: ribs 11–18, straight, undulate, with sharp-angled margins: radial spines about 10, scarcely more than ⅛ in. long, rigid, straight, slender conical, pointed, dark brown to black; centrals 4–8, but very little different from the radials: fls. lateral, 10–15 in. long,

749. Echinopsis gemmata.

white: fr. small, ellipsoidal, about 1 in. long. S. Braz., Uruguay and Argentine Republic. B.M. 3411. B.R. 20:1707.

gemmàta, K. Sch. (*E. turbinàta*, Zucc.). Fig. 749. Stem simple or sometimes branching, at first low spherical or short columnar, later more top-shaped, reaching 1 ft. in height by 4–6 in. in diam., dark green: ribs 13–14, rarely more, straight or sometimes slightly spiral with sharp or obtuse margins, which are but little or not at all undulate; central spines appear first, about 3–6 in number, very short, stiff, black; later the radials appear, about 10–14, longer, horizontally spreading, at first yellowish brown, later horn-colored: fls. lateral or from the upper areolæ, 9–10 in. long, clear white, with a pale greenish midline in the petals. S. Braz.

tubiflòra, Zucc. (*E. Duválii*, Hort. *E. Zuccarínii*, Pfeiff.). Stems spherical to ellipsoidal, at first simple but later more or less branching, reaching 10 in. in height by 8 in. in diam., dark green: ribs 11–12, straight, with margins inconspicuously undulate: radial spines numerous, sometimes as many as 20, unequal, horizontally or obliquely spreading, yellowish white with brown tips, sometimes darker; centrals 3–4, the lowest the longest, reaching ⅝in., later deflexed: fls. lateral, about 14 in. long, white with pale green midline in the petals. S. Braz. and Uruguay. B.M. 3627.

Echinopsis Mulleri is a horticultural name only.

C. H. THOMPSON.

ECHINÓSTACHYS (*spiny head*, from the Greek). A bromeliaceous genus, now referred by Mez to Æchmea, which see. Three species have been offered in the Amer. trade: **E. Hýstrix,** Wittm., for which see p. 28. **E. Pineliàna,** Wittm., which is *Æ. Pineliàna*, Baker: 2–3 ft.: peduncle and bracts brilliant red: lvs. banded, spine-edged: spike dense, 2 in. long, spiny: petals yellow, the tips fringed and incurved. Brazil. B.M. 5321. **E. Van Houtteàna,** Van Houtte, is *Æ. Van Houtteàna*, Mez (*Quesnelia Van Houtteana*, Morr.). Lvs. many, strong spined, sometimes white-banded beneath: fls. white, blue-tipped, in a crowded spike: 1–2 ft. Brazil.

L. H. B.

ECHÌTES (Greek, *viper;* possibly from its poisonous milky juice or from its twining habit). *Apocynàceæ.* A large genus of tropical American twiners related to Dipladenia, and of similar culture. Differs technically from Dipladenia in the 5-lobed disk and the glandular or 5-scaled calyx.

Ándrewsii, Chapman (*E. suberécta*, And.). Lvs. 1½–2 in. long, close together, oval or oblong, mucronate, acute or rounded at the base, margins revolute: peduncles axillary, 3–5-fld., shorter than the lvs.: fls. yellow; corolla tube 1 in. long, ½in. wide, much dilated above the insertion of the stamens, bell-shaped, scarcely longer than the lobes; anthers tapering into a long, bristle-like awn: glands of the nectary 5, rounded, as long as the ovaries. Sandy shores, S. Fla. W. Indies.

paludòsa, Vahl. Lvs. oblong, oval-oblong, or lanceolate-oblong, rounded toward the mucronate top: calyx segments glandular, devoid of an interior scale, oblong, mucronate-blunt, spreading; corolla tube funnel-shaped above a cylindrical base; anthers oblong-lanceolate, acuminate, rounded-cordate at the base, hirsute on the back above.

umbellàta, Jacq. Lvs. ovate or ovate-roundish, mucronate: fls. greenish white; calyx segments glandular, devoid of an interior scale; corolla tube cylindrical, enlarged below the middle, tapering again above; anthers rigid, tapering from a hastate base, glabrous. W. Indies.

W. M.

ÉCHIUM (Greek, meaning unknown). *Borraginàceæ.* VIPER'S BUGLOSS. Coarse herbs and shrubs, with spikes of blue, violet, red or white flowers. Their nearest ally of garden value is Cerinthe, but they are very distinct in general appearance. *E. fastuosum*, for instance, has dark blue, 5-lobed flowers about half an inch across, in spikes 6 inches long and 2 inches wide, perhaps as many as 200 fls. in a spike. Great masses of stamens are thrust out and add to the interest, and the young flower-buds look like pink 5-pointed stars. Three kinds are cult. outdoors in California. There being no published American experience with their cultivation under glass, the following points are gleaned from The Garden 42, p. 884 (1892). In rich soil they grow coarse and scarcely flower, and the flowers are never as richly colored as when the plants are more or less starved. Biennials seed freely, and the seed is sown as soon as gathered. *E. callithyrsum* is a greenhouse shrub or small tree which produces hundreds of spikes during summer. After flowering "the old stems or branches are cut back, when the plant breaks away again, and in this way may be had in bloom almost at will." Cuttings strike freely, flower soon, and make good pot-plants. Seedlings require a greater age and size before blooming. *E. fastuosum* is the handsomest of the shrubby kinds, grows 2–4 ft. high, has long, pale green lvs., covered with soft white hairs, and fls of a peculiarly brilliant deep blue. In California, Franceschi says, Echiums are eminently suited for dry places, and need good drainage. *E. vulgare* is a common weed in the East.

A. *Fls. dark blue.*

cándicans, Linn. f (*E. fastuòsum*, Jacq. f., not Ait.). Forms a bush 3 ft. high, but flowers at 3 ft., and its foliage is green when fresh, hoary white when dry. Branches thick, leafy toward the tips: lvs. lanceolate, the upper ones smaller, crowded and narrower: panicles much looser than the spikes of *E. fastuosum:* fls. sessile, pale blue, the buds reddish purple. Madeira. B.M. 6868. B.R. 1:44.—The fls. are sometimes said to be streaked with white or all white.

AA. *Fls. pale blue.*

fastuòsum, Ait., not Jacq. This has darker blue fls. in a dense spike and perhaps less hoary foliage than *E. candicans.* This was Hooker's conception in 1886 of the relation of the two species, but De Candolle formerly held the opposite opinion. Canaries. R.H. 1876:10. Gn. 10:50.

AAA. *Fls. white.*

símplex, DC. Woody but biennial and not branched: lvs. ample, oval-lanceolate: panicle very long, cylindrical, spike-like, the spikelets 2-fld., pedicelled: stigmas simple.

W. M.

EDELWEISS. See *Leontopodium.*

EDGEWÓRTHIA (after M. P. Edgeworth, English botanist in E. Indies, and his sister Maria). Deciduous shrub, with stout branches: lvs. alternate, entire, short-petioled, crowded at the end of the branches: fls. in dense, peduncled heads, axillary, on branches of the previous year, with or before the lvs., apetalous; perianth tubular, 4-lobed, densely pubescent outside; stamens 8, in 2 rows; stigma elongated: fr. a dry drupe. One species from Himal. to Japan, the bark of which is used for paper-making. Ornamental shrub, with handsome foliage and yellow, fragrant fls. Hardy only South, thriving in any good, well-drained garden soil; if grown in pots a sandy compost of peat and loam, with sufficient drainage given, will suit them. Prop. by greenwood cuttings in spring under glass; also by seeds, obtained from dealers in Japanese plants. Belongs to *Thymelæaceæ.*

Gárdneri, Meissn. (*E. papyrífera*, Zucc. *E. chrysántha*, Lindl.). Lvs. elliptic or oblong-lanceolate, appressed pubescent when young, glabrous above at length, 3–8 in. long: fls. about 1 in. long, densely clothed with yellowish silky hairs outside, in dense heads about 2 in. in diam. B.M. 7180. B.R. 33:48. F.S. 3:289.—Cannot withstand the long, dry summers South.

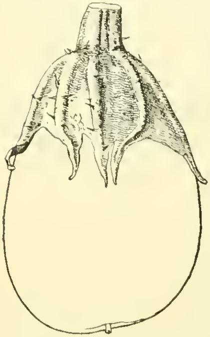
ALFRED REHDER.

EDRAIÁNTHUS. See *Wahlenbergia.*

EDWÁRDSIA. The leguminous genus of this name is now included in *Sophora.*

EEL-GRASS. *Vallisneria spiralis.*

EGGPLANT (*Solànum Melongèna*, Linn.). *Solanàceæ.* GUINEA SQUASH. AUBERGINE of the French. This plant is a native of the tropics, probably from the East Indies, but its native land is not known. It is cultivated to a greater or less extent throughout the entire tropical regions. The first reports of its use as a vegetable come from India, hence the above assumption. In the United States it is cultivated as a vegetable as far north as New York, but it usually grows to greater perfection in the southern states. The demands for it during the early months of the year have not been fully supplied. Its cultivation demands as much a specialist as either celery or tobacco, while the specialization must be in a different direction from that of either one of these. Nearly all of the fruit that grows to proper size is edible, and there is no special demand for particular flavors. Eggplants are forced under glass to a limited extent for home use. They require the temperature of a tomato house, and great care must be taken to keep off red spider and mites. In order to insure large fruits, practice artificial pollination. Non-pollinated fruits will grow for a time, but always remain small (Fig. 750). (Cf. Bailey, Forcing-Book.)


750. Non-pollinated fruit.

Soil. — Eggplant will grow on almost any soil in the South, but it develops to greater perfection on a rich, deep, loamy soil free from debris. In the clay districts this is not easily obtained, but there are often small fields that are sufficiently dry and yet contain enough sand to make Eggplant growing profitable. No matter whether clay land, loam or sandy land be employed for raising this crop, it will be necessary to plow deeply and thoroughly. The land should be drier than that required by cabbage or beets. In fact, it will stand a greater drought than the ordinary vegetables. On the other hand, we should not attempt to grow a crop on land that is composed of large particles, such lands as are ordinarily called thirsty in the vegetable-growing sections of Florida.

Fertilizer.—There is considerable difference in various sections of the country as to whether manure may be applied or not. In the south Atlantic and Gulf states it is not advisable to use stable manure. If this form of fertilizer is at hand, the gardener should make it up in the form of compost, when it will be found to be a very useful material. There have been no experiments performed to indicate which forms of chemical fertilizers are the best. In the absence of such work, we can only give general directions in regard to what may be used. The following formula will be found fairly well balanced for Eggplant in the South. If the soil contains a great deal of humus, less nitrogen may be used. If the soil is poor in this element, nitrogen, a greater amount of nitrogen may be used. On moderately fertile land 500 to 1,000 pounds will be sufficient, while on poor lands as much as 2,500 to 3,000 pounds per acre may be employed.

FERTILIZER FORMULA.

Nitrogen	4%
Potash	9%
Available phosphoric acid	5%

The following table of fertilizers will suggest useful amounts of the different elements when we wish to employ 500 pounds of the above formula to the acre (particularly for the South):

Nitrogen	350 lbs. cotton seed meal; or, 200 lbs. dried blood; or, 150 lbs. nitrate of soda; or, 100 lbs. sulphate of ammonia.
Potash	500 lbs. kainit; or, 90 lbs. muriate of potash; or, 200 lbs. sulphate of potash and sulphate of magnesia.
Phosphoric acid	250 lbs. acid phosphate; or, 200 lbs. dissolved bone.

Propagating the Seedlings.—The time required to bring plants into bearing from seeds varies with the conditions of the soil and temperature. During cool weather the plants grow very slowly, but during hot weather they grow rapidly and mature fruit in much less time. Those who wish to have early fruit and are able to use hotbeds or propagating houses should sow the seed 120 to 150 days before the fruit is wanted. Prepare the hotbeds as for other seedlings, and sow in rows a few inches apart. When these are beginning to show their leaves, or when the seedlings are beginning to look spindly, they should be pricked out and transferred to another bed. In this each plant should be given about a 2-inch square; then they may be forced until the plants crowd one another in the bed, when they should be transferred again. When the plants have attained the size of 6 inches, and the atmosphere will permit, they may be set out in the field.

A somewhat more laborious, but at the same time more successful plan, is to plant the seedlings in 2-inch flower pots, and then shift to larger ones as often as the plants become pot-bound or crowd one another in the bed. Fig. 751 represents a plant, three-tenths natural size, just taken from a flower pot and ready to be shifted to a larger one. By shifting until 6-inch pots are reached, the Eggplant may be forced along without injury to blooming size or even to a size when fruit is beginning to set, and then set out in the field without injury to the plants or crop.

Eggplant growers should bear in mind constantly that from the time of sprouting the seeds to the harvesting of the crop, the plants cannot stand a severe shock in their growth without detriment to the crop. When the plant is once started it should then be forced right along, and never allowed to become stunted during its growth. The amount of damage done by neglecting plants before they are set to the field varies with the severity of the shock and the length of time during which the plant undergoes the disadvantageous conditions. If it becomes necessary to harden the plants off before setting them to the field, this should be done gradually.

Culture in the Field.—After the field has been thoroughly prepared in the way of plowing and fertilizing, which should have been done at least two weeks before the plants were set out, the rows should be laid off from 3 to 4 feet apart. The plants may be set from 2 to 4 feet apart in the row, varying with the varieties to be used and the soil. Tillage should be continued, and varied according to the conditions of the weather. During a wet season it is well to cultivate the land as deeply as possible, while during dry weather cultivation should be shallow, simply sufficient to keep the weeds from growing, to keep the soil well aired, and to keep a mulching of dry soil on the land. Under ordinary circumstances it does not pay to prune or pinch out the buds, but where the season is short this may be resorted to with some advantage. If it is desirable to

751. Pot-grown plant ready for setting in the field.

have the fruit attain a certain size before frost, one may begin to pinch out the blossoms and new growth about three weeks before its usual occurrence. This same process will be of advantage where the fruit is to be brought into market at a certain time.

752. Field-grown plant of New York Improved Eggplant.

Marketing.—As a rule, it is better to cut the fruit from the plant than to break it, especially if the work is done by careless laborers. After cutting, it may be placed in large market baskets and hauled to the packing house. For distant market, the fruits should be wrapped separately in heavy brown paper. The proper crate for this vegetable is the barrel crate. As this is considered one of the staple vegetables, we do not gain much by using fancy wrappers or packing it in fine crates, hence we may use such material as may be left over from shipping fancy vegetables. It also stands shipment to distant markets, so that, if there is no danger of reduction in price, it is quite as well to ship by freight as by express.

Varieties.—There are only a few varieties offered in the market. The New York Improved Spineless matures a little earlier than the Black Pekin. The New York Purple (Fig. 752), Black Pekin, and the New York Spineless are excellent for shipping purposes. The above varieties are the black-fruited, and the most popular in the United States, while the white-fruited sorts are said to be the most popular in Europe. For home use, the white-fruited varieties are preferable, but as these make poor sellers in the United States, we must raise the purple sorts for market. For home gardens, the early and small Early Dwarf Purple (Fig. 754), is useful. It is particularly recommended for northern climates. There are three main types of Eggplants, as follows (Bailey, Bull. 26, Cornell Exp. Sta.): The commoner garden varieties, *Solànum Melongèna*, var. *esculéntum*, Bailey (Figs. 752, 753); the long-fruited or "serpent" varieties, *S. Melongèna*, var. ***serpentìnum***, Bailey; the Early Dwarf Purple type, var. ***depréssum***, Bailey (Fig. 754). See *Solanum.* The so-called Chinese Eggplant is a different species, for which consult Solanum.

Seed-growing.—This is by no means a difficult operation, and may be done profitably in certain sections of the South. For this purpose all defective or dwarfed plants in the field should be cut out. By a little attention one will be able to know when the seeds have matured sufficiently for gathering. At this time the eggs usually turn a lighter color or even somewhat yellow. The fruit should be gathered and carried to the packing house, where it may be left in a pile for 2 or 3 days, as there is very little danger from rotting. When a sufficient number have been collected the laborers may be set to paring off the extra amount of meat on the outside of the seed. The remaining core may then be cut longitudinally into quarters or eighths, using a dull knife to avoid cutting the seed. After a quantity of these have been pared, they may be placed in a barrel and covered with water. The barrel should not be made more than two-thirds full. In a day or two fermentation will set in and the meaty portion will macerate from the seed. The seed may then be separated from the meat by means of sieves, using first wide-meshed ones to remove the meat and then finer-meshed ones to screen out the seed from the finer pulp. The seed should not be allowed to stand more than 2 or 3 days in the macerating barrel, as the heat evolved by fermentation and the heat of the summer is liable to cause them to germinate. After separating the seed from the pulp, it should be dried in the shade and wrapped in secure packages. By covering with tin foil or oil paper, the atmospheric moisture will be kept out and molding prevented.

Diseases.—The most destructive of diseases in the lower South is a blight fungus which attacks the plant just beneath the surface of the ground, causing the softer tissues at this point to rot off and the plant to die. The fungus is not able to penetrate the harder portion of the stem, consequently the plant lingers along for weeks after being attacked. A number of attempts have been made to cause this blight fungus to produce fruiting organs so that it could be classified, but up to the present this has proved futile. In such cases as this we have no remedy. After the plant is attacked, it is usually doomed.

Much, however, can be done in the way of preventing the spread of this fungus. If all plants are destroyed as soon as found to be affected, the fungus cannot perfect its sclerotia, or resting state, and thus its propagating is prevented. The normal home of this fungus is in decaying vegetable matter. If, therefore, we keep our field free from this sort of material we will do much to prevent this fungus from being present. Some soluble form of fungicide, as Eau Celeste

753. Long White Eggplant.

or potassium sulphide, may be sprayed about the roots of the plants to good advantage. Practice rotation of crops.

A second form of blight is caused by *Bacillus solanacearum*, Smith. This disease has its origin of infection in the leaves, and is introduced by means of insects which have fed upon diseased plants and carried the infection to the well ones. The disease works rapidly down the tissues, and causes the death of the leaf and finally of the whole plant. The only remedy for this is to destroy all plants that are affected with the disease as soon as detected, and kill off all insects. When this disease is known to be present in a section, it is best to set the plants as far apart as practicable. In this way the danger of infection from insects is somewhat reduced. When the disease is known to be present in a field it should not be planted to this crop.

Insect Enemies.—Among the most annoying of the insect enemies we must place the cut-worm (larvæ of Noctuidæ). These insects are almost omnipresent, and when nearly full grown are liable to cut off plants that are 4 or 5 inches high. It is not common for one insect to cut off more than a single plant, but in ordinarily fertile soil there are enough cut-worms present to destroy the entire field. So that, on the whole, it becomes very annoying. Where these insects are quite destructive, it is possible to kill them with poisoned bran or poisoned cotton-seed meal, sweetened with syrup or sugar.

754. Sprays of Early Dwarf Purple Eggplant.

Another insect that does more or less damage is the cotton-boll worm (*Heliothis armigera*). This insect does its damage by boring a hole into the stems or the fruit. In the latter case it causes it to rot before it is picked, or possibly in transit. As the fruit becomes larger there is less danger of attack from this insect, so that the main trouble occurs in the earlier stages of its growth.

The Eggplant aphis (*Siphonophora cucurbitæ*) is one of the most annoying pests to this crop. It usually makes its appearance about the time the crop is fit to ship, and appears in such numbers that the plants are ruined in the course of a week or two. The insect attacks the lower surface of the leaves, making it difficult to reach the pest with insecticides, but persistent efforts and a good tobacco decoction, applied with a fine nozzle, will give considerable relief. Anthracnose (*Glœasporium melongenæ*) does not cause great damage to this crop, but is one of the agents that reduce the profits. "It may be recognized by its producing decided pits in the fruit, upon which soon appear minute blotches bordered with pink.' Bordeaux mixture may be used to good advantage for preventing this disease.

Phoma Solani frequently causes damping-off in the hotbed. It often renders a whole bed worthless. Plants affected with this fungus usually fall over as if eaten off by some insect. Some plants, however, continue a miserable existence and finally die. Careful examination will reveal the point of injury, which is at the ground level. The best preventive is to use well drained beds, and then avoid excessive watering. When damping-off is detected in a seedling bed, the atmosphere and surface soil should be dried as rapidly as possible, followed by one application of fungicide. P. H. Rolfs.

EGLANTINE. *Rosa Eglanteria.* Less properly applied to *Rubus Eglanteria* and *Rosa rubiginosa.*

EGYPTIAN BEAN. Same as Black Bean, *Dolichos Lablab.*

EGYPTIAN LOTUS. See *Nymphæa Lotus;* also *Nelumbium.*

EHRÈTIA (G. D. Ehret, botanical painter, born in Germany, 1708, died in England, 1770). *Borraginàceæ.* About 50 species of tender trees and shrubs, found in the warmer regions of the world. Two species are cult. outdoors in S. Calif. and 2 others in European greenhouses. Plants with or without rough, short hairs: lvs. alternate, saw-toothed or not: fls. small, often white, in cymes, corymbs, terminal panicles, or rarely all borne in the upper axils. The 2 species described below are evergreen trees in S. Calif., attaining a height of 30 ft. Seeds may be obtained through dealers in Japanese plants.

A. *Lvs. saw-toothed.*

B. *Foliage hairy.*

macrophýlla, Wall. Lvs. ovate, acute, sharply toothed, with long, harsh, rigid hairs above and soft pubescence beneath: panicle terminal, pubescent: calyx ciliate: fr. globose, obscurely 4-grooved. Himalayas.

BB. *Foliage not hairy.*

acuminàta, R. Brown (*E. serràta*, Roxb.). Heliotrope Tree. This belongs to a different tribe of the same family with the Heliotrope, and the white fls. have a honey-like odor. Lvs. oblong-lanceolate, acuminate: panicles terminal and axillary: fls. clustered, sessile. Trop. Asia and Aust.—"Drupes red, the size of a pea; said to be edible." *E. N. Reasoner*, Oneco, Fla.

AA. *Lvs. usually not toothed.*

ellíptica, DC. Tree, 15–50 ft. high: lvs. oval or oblong, sometimes saw-toothed, nearly hairless, or with minute hairs and very rough above: fr. a yellow globose drupe, the size of a small pea, with edible thin pulp. Tex., Mex. W. M.

EICHHÓRNIA (after J. A. F. Eichhorn, a Prussian). *Pontederiàceæ.* This genus includes the Water Hyacinth (see Fig. 755), the famous "million dollar weed" that obstructs navigation in the St. John's river, Florida, and is a source of wonder and delight in every collection of tender aquatics in the North. The curious bladders made by the inflation of the petioles help the plant to float freely. About flowering time the plant sends down anchoring roots which, if the water be only 3 or 4 inches deep, penetrate the soil. The true Hyacinths belong in an allied order; the Pickerel-weed, in the allied genus Pontederia, the ovary of which by abortion is 1-celled, and each cell 1-ovuled, while Eichhornia is 3-celled and many-ovuled.

The plants of this order have been greatly confused by botanists, partly because the fugacious, membranous flowers are not well preserved in dried specimens, and partly because of variation in form of leaves, depending upon whether the plants grow in deep or shallow water, or in mud. The common Water Hyacinth sends out two kinds of roots, the horizontal ones often thick and fleshy, and apparently for reproductive purposes, the vertical ones long, slender, and clothed with innumerable small, horizontal fibers. Water Hyacinths are of easy culture and are propagated by division or seed. If grown in about 3 in. of water, so that the roots may reach the soil, the petioles become elongated and the plant becomes weedy and unsatisfactory.

A. *Leaf-stalks inflated: inner perianth-segments not serrated.*

speciòsa, Kunth (*E. crássipes*, Solms. *Pontedèria crássipes*, Mart.). Fig. 755. Lvs. in tufts, all constricted at the middle, bladder-like below, sheathed, many-nerved: scape 1 ft. long, with wavy-margined sheaths at and above the middle: fls. about 8 in a loose spike, pale violet, 6-lobed, the upper lobe larger and having a large patch of blue, with an oblong or pear-shaped spot of bright yellow in the middle: stamens 3 long and 3 short, all curved upwards towards the tip. Braz. B.M. 2932, erroneously, as *Pontederia azurea*. I.H. 34:14. A.F. 5:511. Var. **màjor**, Hort., has rosy lilac flowers. Var. **aùrea**, Hort., has yellowish flowers.

AA. *Leaf-stalks not inflated: inner perianth-segments beautifully serrate.*

azùrea, Kunth. Lvs. on long or short not-inflated petioles, very variable in size and shape: scape often as stout as the leaf-stalk, gradually dilated into a hooded spathe: fls. scattered or crowded in pairs along a stout, hairy, sessile rachis; perianth bright pale blue, hairy outside, inner segments beautifully toothed, the upper a trifle larger, with a heart-shaped spot of yellow, which is margined with white. Braz. B.M. 6487. G.C. II. 25:17. I.H. 34:20. R.H. 1890:540.—One plant will become 5 or 6 ft. across in one season.

WM. TRICKER and W. M.

ELÆÁGNUS (ancient Greek name, meaning a kind of willow; from *elaios*, olive). *Elæagnàceæ*. Shrubs or small trees: lvs. alternate, deciduous or persistent, entire or nearly so, clothed more or less with silvery or brownish scales: fls. axillary, solitary or in clusters, apetalous; perianth companulate or tubular, 4-lobed; stamens 4, included, on very short filaments: fr. a 1-seeded drupe. About 15 species in S. Europe, Asia and N. America. Highly ornamental shrubs with handsome foliage and mostly decorative frs.; the fls. are inconspicuous, but mostly fragrant. Some of the deciduous species, as *E. argentea, longipes, multiflora* and *umbellata*, are hardy North, while the evergreen ones are hardy only South. A distinct feature of some species, as *E. argentea, angustifolia* and *parvifolia*, is the conspicuous silvery hue of their foliage, while *E. longipes* is the most ornamental in fruit. They grow in almost any well drained soil, also in limestone soil, and prefer sunny position. Prop. by seeds and by cuttings of mature and half-ripened wood; also sometimes increased by layers and by root-cuttings; varieties and rarer kinds can be grafted on seedlings of vigorous growing species.

Index of names (varieties and synonyms in italics):

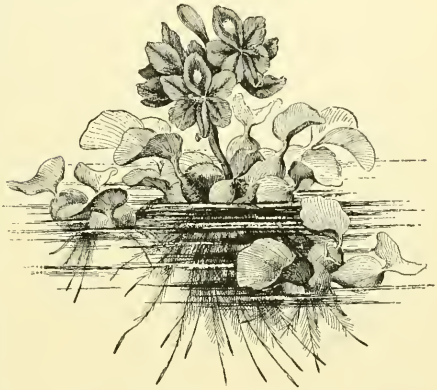
angustifolia, 1.
argentea, 6.
aureo-variegata, 8.
edulis, 5.
Frederici variegata, 8.
hortensis, 1.
Japonica, 2.
longipes, 5.
macrophylla, 7.
maculata, 8.
multiflora, 4.
orientalis, 1.
parvifolia, 2.
pungens, 8.
reflexa, 8.
Simoni, 8.
umbellata, 3.
variegata, 8.

A. *Lvs. deciduous.*

B. *Branchlets and lvs. beneath silvery white, without any brown scales.*

1. **angustifòlia**, Linn. (*E. horténsis*, Bieb.). OLEASTER. Shrub or small tree, to 20 ft., sometimes spiny: lvs. lanceolate or oblong-lanceolate, quite entire, light green above, 2–3 in. long: fls. short-pedicelled, 1–3, axillary, on the lower parts of the branches; perianth campanulate, tube about as long as limb, yellow within, fragrant; style at the base included by a tubular disk: fr. oval, yellow, coated with silvery scales. June. S. Europe, W. Asia. Var. **orientàlis**, Schlecht. (*E. orientàlis*, Linn. f.). Spineless: lvs. often oblong or oval, clothed more with stellate hairs beneath than with scales, usually glabrous above at length: fr. rather large. Var. **spinòsa**, Dipp. (*E. spinòsa*, Linn.). Spiny: lvs. linear-lanceolate or lanceolate, scaly above and densely scaly beneath: fr. smaller. L.B.C. 14:1339. B.R. 14:1156.

2. **parvifòlia**, Royle (*E. Japónica*, Hort.). Shrub or small tree, to 20 ft., with erect stems and spiny, spreading branches: lvs. elliptic-ovate or oblong-lanceolate, crisped at the margin, usually with stellate hairs above, glabrous at length, silvery beneath, 1½–3 in. long: fls. axillary, usually crowded on short lateral branchlets, short pedicelled; perianth narrow, tube longer than limb, whitish within, fragrant: fr. globose or nearly so, densely silvery when young, pink when ripe, ⅓ in. long. June. Himalayas, Japan. B.R. 29:51. Mn. 5:145.—Not quite hardy North. Sometimes cult. under the name of *E. reflexa*, which species, however, is evergreen. Var. *Japonica macrophylla* is advertised, but probably does not belong to this species.



755. Eichhornia speciosa (× 1·6).

BB. *Branchlets with reddish or yellowish brown scales and sometimes silvery besides: lvs. silvery white beneath, often with few brown scales.*

C. *Fr. juicy, scarlet-red or brownish red.*

3. **umbellàta**, Thunbg. Spreading shrub, to 12 ft., often spiny, with yellowish brown branchlets, often partially silvery: lvs. elliptic or ovate-oblong, silvery-scaly above, without brown scales beneath, crisped at the margin, 1½–3 in. long: fls. yellowish white, fragrant, axillary, 1–3 usually crowded on short lateral branchlets; tube of perianth longer than the limb: fr. globose or roundish oval, scarlet, ¼–⅓in. long, erect, rather short-stalked, clothed with silvery scales when young, ripening late in fall, while the similar *E. parvifolia* ripens much earlier. May, June. Japan. A.G. 12:206. M.D.G. 1899:569.

4. **multiflòra**, Thunbg. Spreading shrub, to 8 ft., spineless; branchlets reddish brown: lvs. elliptic or ovate-oblong, with scales or stellate hairs above, often glabrous at length, usually with few brown scales beneath: fls. 2–3, axillary, usually crowded on short lateral branchlets; tube longer than the limb: fr. acid, oval or roundish-oval, scarlet, ¼–⅓in. long, erect or nodding, with brown scales when young, ripening in July or August, rarely later: pedicel as long as or somewhat longer than fr. May, June. Japan. M.D.G. 1899:569.—Very variable species, and perhaps the former and the following are only varieties of it.

5. **lòngipes**, Gray (*E. édulis*, Hort.). GOUMI. Fig. 756. Shrub, to 6 ft., with reddish brown branchlets: lvs. elliptic, ovate or obovate-oblong, with stellate hairs above, usually glabrous at length, mostly with scattered brown scales beneath, 1–2½ in. long: fls. 1–2, axillary, on the lower part of the branches or on short branchlets, yellowish white, fragrant; tube as long as the limb: fr. pendulous, oblong, ¾ in. long, scarlet, on slender peduncles, much longer than the fr.; fr. with brown scales when young, ripening in June or July, of agreeable, slightly acid flavor. April, May. Japan, China. B.M. 7341 (as *E. multiflora*). G.F. 1:499. G.C. 1873:1014 Gng. 1:275, 277.

CC. *Fr. rather dry, silvery white.*

6. **argéntea**, Pursh. Erect shrub, to 12 ft., spineless, stoloniferous, with reddish brown branchlets: lvs. ovate

or oblong-lanceolate, silvery on both sides, often with scattered brown scales beneath, 1–3 in. long: fls. 1–3, axillary, yellow within, fragrant: fr. oval or roundish oval, densely clothed with silvery scales, short-pedicelled, ⅓–½in. long. May, June. Canada, south to Quebec, Minnesota, Utah. B.B. 2:467.

756. Elæagnus longipes (× ½).

AA. *Lvs. evergreen: usually flowering in fall.*

7. **macrophýlla,** Thunbg. Spineless shrub, to 6 ft., with silvery white branchlets: lvs. broad-ovate or broad-elliptic, on stout and rather long petioles, scaly above, usually glabrous at length, silvery white beneath: fls. axillary, with silvery and brownish scales outside; tube companulate, abruptly narrowed at the base, as long as limb. Japan.

8. **púngens,** Thunbg. Spreading shrub, to 6 ft., mostly spiny, with brown branchlets: lvs. oval or oblong, undulate and often crenulate at the margin, at length glabrous above, silvery beneath, more or less interspersed with brown scales, 2–4 in. long: fls. in axillary clusters; tube cylindrical, slightly narrowed at the base, longer than the limb: fr. short-stalked, about ¾in. long, with silvery and brown scales. Japan. Var. **Fréderici variegàta,** Hort. Lvs. with yellow center and green margin. Var. **maculàta,** Hort. With large yellow blotches. A. G. 13:122. Var. **Simoni,** Hort. Lvs. rather large, oblong-elliptic, with few brown scales beneath or nearly without. Var. **Simoni tricolor,** Hort. Lvs. like the former, but variegated with yellowish and pinkish white. Var. **refléxa,** Hort. Branches spineless, elongated and flexile: lvs. with scattered brown scales beneath. Var. **variegàta,** Hort. Lvs. margined yellowish white. Var. **aùreo-variegàta,** Hort., probably belongs here.

E. ferrugínea, A. Rich. Spineless evergreen shrub, with spreading brown branches: lvs. with yellowish and brown scales beneath; perianth with quadrangular, abruptly contracted tube: fr. long-stalked. Japan.—*E. glàbra*, Thunbg. Spineless evergreen shrub, with brown branches: lvs. shining above, with yellow and brown scales beneath: perianth with slender, tubular tube, gradually narrowed toward the base, twice as long as the limb: fr. short-stalked. Japan.—*E. reflèxa*, Morr. & Decne. (E. glabra × pungens). Evergreen shrub, with brown branches: lvs. glabrous above, whitish beneath, densely interspersed with yellowish and light brown scales, giving the under surface a bronzy golden hue: perianth with slender tube: fr. short-stalked. Japan.—*E. refléxa*, Hort.=E. pungens var. or E. parvifolia.

ALFRED REHDER.

ELÆIS (Greek, *olive*). *Palmàceæ*, tribe *Cocoíneæ*. Tropical spineless palms with pinnate foliage, of which the best known is the Oil Palm of western Africa, whose red fruits, borne in large clusters, yield the palm oil of commerce, which is used in making candles and soap. Young plants are grown for ornament in S. Calif., and under glass North. The other 6 species are from tropical S. America. The genus is separated from Cocos by the 1–3-seeded fruits, with 3 pores above the middle.

Guineénsis, Jacq. OIL PALM. Stems stout, 20–30 ft., coarsely and deeply ringed: leaves 10–15 ft.; petiole spiny-serrate; leaflets linear-lanceolate, acute, the same color above and below. F.S. 14:1492.—*Elæis Guineensis*, from an early stage in growth, is one of the most ornamental palms. Until it reaches several feet in height it is a slow grower, consequently we do not see much of it, except in collections. It does best in a warm temperature, although it will thrive in an intermediate house. Seeds are always obtainable from several of the large European houses. It is but little grown as a commercial palm, as young plants do not show their full character. Given same treatment as *Areca lutescens*, will grow well. This treatment includes night temperature of 65° and plenty of water.

JARED G. SMITH, G. W. OLIVER and W. H. TAPLIN.

ELÆOCÁRPUS (Greek, *olive-fruit*). *Tiliàceæ.* This genus includes a tender evergreen flowering shrub of very distinct appearance. The creamy white petals, charmingly fringed, the bright red sepals and pedicels, and the mass of yellow stamens are the chief features. The racemes contain 2–5 pendulous flowers, which are about half an inch across, and fragrant. This plant was once advertised by Pitcher and Manda, and may exist in a few choice collections. The genus has about 50 species, all from tropical Asia, Australia and the Pacific isles. In the tropics they are trees, with alternate, rarely opposite lvs., which are entire or saw-toothed, and in some species sparingly spotted with black beneath: fls. axillary, in racemes; petals glabrous or silky: drupes oblong or globose.

grandiflòrus, James Smith. A much-branched shrub, about 7 ft. high under glass: lvs. considerably clustered at the ends of branches, 3–6 in. long, broadly lanceolate; petiole a fourth to 1 in. long, with a few distant saw-teeth, or more or less round-toothed or wavy-margined: sepals 5, red outside, white inside; petals 5. Java. B.M. 4680.—Lvs. rather leathery, dark green above, paler beneath. Warmhouse. Prop. by cuttings of nearly ripened wood. Not common.

E. cyàneus, Sims, named for its blue fruits (which are not known in cultivation), has broader and less tapering lvs., with more numerous teeth, and membranous texture, and the sepals are white outside. Australia. B.M. 1737.

W. M.

ELÆOCÓCCA is all referred to *Aleurites cordata*.

ELÆODÉNDRON (Greek for *olive tree*, from the resemblance of the fruit to that of the olive). *Celastràceæ*. Perhaps 40 species of shrubs or small trees in tropical countries, chiefly in the Old World tropics. Lvs. simple, entire or crenate, opposite or alternate, thickish, frequently evergreen: fls. inconspicuous, greenish or white, in axillary clusters; calyx 4–5-parted; petals 4–5, and exceeding the calyx; stamens 4–5: ovary single, surrounded by a fleshy ring: fruit a small fleshy drupe. Certain plants which, before they had bloomed, were referred to Aralia, are now known to belong to this genus, representing a distinct natural family. Culture of Aralia.

orientàle, Jacq. (*Aràlia Chabrièri*, Hort.). A most graceful and handsome plant, with linear-lanceolate alternate, shining, drooping leaves, 10–12 in. long, and with a reddish rib. Madagascar, Mauritius. R.H. 1891, p. 224. A.F. 10:1041.—Holds its lower foliage well, or throws out new foliage to take the place of that which drops. In the early descriptions, the plant was said to have pinnately compound lvs., but what were taken for leaflets are really lvs. Still a rare and choice plant in this country. Thrives in either an intermediate or a warm house. Prop. by single-eye cuttings in small pots, kept rather warm. See, also, p. 87.

austràle, Vent. Int. into S. Calif. from Australia, and prized for its holly-like foliage. In its native habitat it is a tree 30–40 feet high, producing useful close-grained wood.

L. H. B.

ELAPHOGLÓSSUM. See *Acrostichum*.

ELDER and **ELDERBERRY.** See *Sambucus*.

ELECAMPANE. *Inula Helenium*.

ELECTRO-HORTICULTURE is a term used by Siemens to designate the application of the electric light to the growing of plants. The term is an unfortunate one, since the use of electric light is not an application of electricity itself to plant-growing, but is merely a device for securing illumination. Any strong artificial light hastens assimilation, and thereby causes plants to grow more rapidly. The practical questions to be considered are, therefore, the expense of using the light and determining whether there are injurious elements in the spectrum of the given light.

The spectrum of the electric arc light is the spectrum of carbon plus that of certain gases incident upon combustion. The spectrum of the arc light is rich in rays which lie beyond the luminous part, and these rays are very injurious to most plants. These rays of the ultra-violet part of the spectrum are eliminated by a plain glass, so that when the electric light is surrounded by a globe, or when the light is hung above the roof of the greenhouse, the injuries are reduced to a minimum. Long-continued experiments at Cornell University have shown that each kind of plant behaves in its own way in the presence of electric light. It is not possible to prophesy what the results may be in a given species. A few plants, as tomatoes, English cucumbers, and carrots, seem to be very little affected either injuriously or beneficially. Nearly all flowers are hastened into bloom by the influence of the light, and their colors are often brighter than under normal conditions; but in many instances they do not last so long. The best results are secured if the light is applied to the plants when they have reached nearly or quite their full stature. If applied very early in their growth, they tend to make flowers before the plant has attained sufficient size. In floriculture, therefore, the chief practical value of the electric arc light seems to be its influence in hastening the flowering of certain plants in dark climates, or when plants must be had for a definite season. For instance, if the light is applied to Easter lilies for a month before their normal blooming time, the period of bloom may be hastened from four to ten days.

Lettuce has shown greater beneficial results from the application of the electric light than any other plant with which careful experiments have been made. Lettuce which receives light from the arc lamp for half of each night may be expected to reach marketable size from one to two weeks before the normal crop.

As a rule, better results are secured when the light runs only half the night. A common two-thousand candle-power light has a marked effect on the growth of many plants at a distance of sixty to even one hundred feet. The incandescent light has a similar influence, but not so marked. The incandescent or Welsbach gas light is also capable of hastening the growth of plants.

As now understood, the application of the electric light to the growing of plants is a special matter to be used when the climate is abnormally cloudy or when it is desired to hasten the maturity of crops for a particular date. Only in the case of lettuce has it been proved to be of general commercial importance; and even with lettuce, it is doubtful if it will pay for its cost in climates which are abundantly sunny. For the literature of the subject, consult the publications of the Experiment Stations of Cornell University and of West Virginia.

L. H. B.

ELEÓCHARIS (Greek-made word, meaning *delighting in marshes*). *Cyperàceæ.* Rush-like native plants, mostly of low, wiry growth, and commonest in marshes and on muddy shores. They are mostly perennial. The culms are simple, terete or angular, bearing a spherical or oblong head of inconspicuous fls.: lvs. usually reduced to mere sheaths. They are interesting for the borders of ponds, and are very easy to naturalize. Three species have been offered by collectors: **E. equisetoìdes,** Torr. A shore plant, with terete hollow culms 2–3 ft. high, and cylindrical heads about the thickness of the culm; resembles horse-tail (Equisetum). **E. aciculàris,** R. Br. Hair-like, 6 in. high, making grass-like mats. **E. ovàta,** R.Br. Culms nearly terete, 12 in. high: head globose or ovate.

L. H. B.

ELEPHANT'S EAR is a name for Begonias. The Elephant-Ear Caladium is a Colocasia.

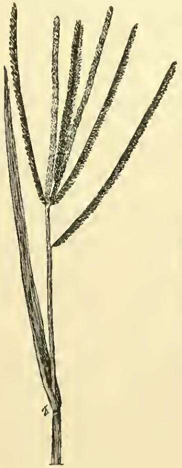
ELEPHANT'S FOOT. *Testudinaria.*

ELETTÀRIA (native name). *Scitaminàceæ.* Differs from Amomum in technical characters, as in the slender tube of the perianth, the presence of internal lobes in the perianth, and the filaments, not prolonged beyond the anther. Perhaps only 2 species, although more have been described. **E. Cardamòmum,** Maton, affords the small Cardamons of commerce, which are the dried capsules, and which are used in medicine. The large or China Cardamons are from species of Amomum. The Cardamons of Nepal and Bengal are Amomum; those of S. India are Elettaria. The Elettaria is native to India, but is cult. in Jamaica, and it will no doubt thrive in parts of S. Fla. Plants have been offered by Reasoner Bros. The Cardamon plant grows 5–10 ft. high, bearing an erect, jointed, closely sheathed stem, and lanceolate acuminate entire nearly sessile lvs. often 2 ft. long: fls. purple-striped. It is said to prefer shade and a moist soil. In three or four years plants give full crops, but they become more or less exhausted after bearing three or four crops. Prop. by dividing the roots and by seeds. Under glass, handled the same as Alpinia.

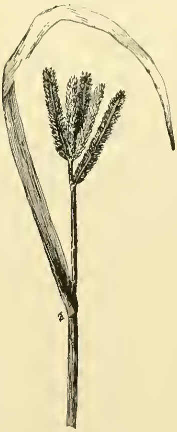
L. H. B.

ELEUSÌNE (Greek, *Eleusis*, the town where Ceres, the goddess of harvests, was worshipped). *Gramíneæ.* CRAB GRASS. YARD GRASS. Coarse, tufted annuals, with the stout unilateral spikes digitate at the apex of the culm. Spikelets several-fld.; arranged in two rows along one side of a continuous rachis, rachilla articulate above the empty glumes: fls. perfect or the upper one staminate: grain loosely enclosed by the fl.-glume and palet. Species 5 or 6 in tropical regions of the Old World. Some are valued as cereals in Africa, India, and some other eastern countries. For *E. Ægyptìaca,* see *Dactyloctenium.*

Índica, Gærtn. DOG'S TAIL. WIRE GRASS. Fig. 757. Erect, 2–4 ft. high; culms ascending, flattened: spikes 5–7, about 2–4 in. long, digitate, often with one or two lower down: spikelets 3–6-fld. Blooms from June to October.—A very common grass in cultivated fields and dooryards in the South, often troublesome as a weed on lawns.



757. Eleusine Indica. (× ½.)



758. Eleusine coracana. (× ½.)

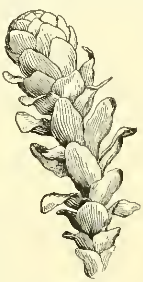
coracàna, Gærtn. AFRICAN MILLET. Fig. 758. Erect, 2–4 ft high, closely related to and much resembling *E. Indica.* Can be distinguished from it by its stouter habit, shorter, broader and larger spikes.—Cult. in India, China and Japan for the grain. Beer is brewed from the grain in Abyssinia. In cult. in America as an ornamental grass. Coracana means "of the crows."

Barcinonénsis, Costa. Culms tufted, 6 in. to 1 ft. high: leaf-blades short, about one-sixteenth of an in.

wide, obtuse at the apex: spikes broad, 2–4, digitate, 1–1½ in. long; spikelets closely imbricate, 5-fld.—Int. into Amer. on ballast, and in cult. as an ornamental plant. P. B. Kennedy.

ELEUTHEROCÓCCUS (Greek, *eleutheros*, free, and *kokkos*, kernel; the seeds are easily detached from the flesh). *Araliàceæ.* Ornamental hardy shrubs, with numerous erect, spiny stems, rather large, digitate lvs., inconspicuous greenish fls., and black berries in umbels. They prefer a somewhat moist and rich soil, and are well adapted as single specimens on the lawn or in borders of shrubberies for the handsome bright green foliage. Prop. by seeds and root-cuttings. Three species in E. Asia, with alternate, long-petioled, digitate lvs.: fls. small, greenish, polygamous-diœcious, 5-merous, pedicelled, in terminal, peduncled umbels: berry roundish oval, black, shining, 5-seeded.

senticòsus, Maxim. Shrub, to 15 ft., the branches densely covered with slender spines: lfts. 5, rarely 3, oblong, usually narrowed at the base, acute, sharply and doubly serrate, sparingly hispid above, with bristly hairs on the veins beneath, 4–6 in. long: fr. about ⅓ in. high. July. N. China. Gt. 12:393. Alfred Rehder.



759. Winter bud of Elodea. Nat. size.

ELIOT, JARED, author of the first American book on agriculture, was born November 7, 1685, and died April 22, 1763. He was the grandson of John Eliot, the "apostle of the Indians," and was pastor at Killingworth, Conn., from October 26, 1709, until his death. He was a botanist, and the leading consulting physician in New England. He introduced the mulberry tree into Connecticut, wrote an essay upon the silkworm, and discovered a process of extracting iron from ferrugineous sands. His "Essays upon Field-Husbandry," begun in 1748, formed the first American book devoted exclusively to agriculture. It is now extremely rare. He was a high-minded, progressive and useful citizen. Many of his sermons were separately reprinted. Jared Eliot and Samuel Deane were among the few agricultural writers of note in the period before American horticulture was considered distinct from agriculture. W. M.

ELLIÓTTIA (after Stephen Elliott, South Carolina's early and excellent botanist. For a fine portrait and sketch of him, see G.F. 7:204–206). *Ericàceæ.* A genus allied to Rhododendron and Ledum, with three species, of which the most interesting is an extremely rare native southern shrub, with delicate white flowers, an inch in diameter, composed of 4 slender petals, and borne in racemes 6–10 in. long. John Saul once advertised it, and P. J. Berckmans, of Augusta, Ga., still cultivates it. The two Asiatic species are inferior in size and beauty of flowers. Important generic characters which distinguish this genus from Leiophyllum and Cladothamnus are: flowers terminal, racemose; petals 3–5, entire: anthers 4–10, opening by irregular cracks: ovary 3–5-celled.

racemòsa, Muhl. Shrub, 4–10 ft. high, branches slender: lvs. alternate, oblong, acute at both ends, glandular-mucronate, entire, thin, membranous, 3–4 in. long, 1–1½ in. wide; petioles slender, grooved, hairy, about 1 in. long: calyx lobes 4, short, rounded: stamens 8: fr. unknown. Wet, sandy woods of S. C. and Ga. G.F. 7: 205. W. M.

The plants formerly offered by John Saul were incorrectly named, and he refunded whatever amount had been charged for all plants sold by him. They proved to be *Styrax grandiflora*. The only plants now known to exist are a few specimens collected by the writer, in company with Dr. Asa Gray in 1873, in a patch in Columbia county, Ga., which covered an area of about 3 acres. This was afterwards cleared, and not a vestige of Elliottia remains. A small patch is said to exist in Edgefield county, S. C., near the city of Augusta, Ga., but all my efforts to find it have failed.

The only plants which the writer has ever been able to propagate came from suckers. A few of these were sent to the Arnold Arboretum and to Kew Gardens. No seed has ever been produced upon our specimens, which are now 15 feet high. P. J. Berckmans.

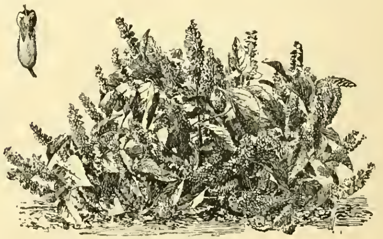
ELM. See *Ulmus.*

ELODÈA (Greek, *marshy*). *Hydrocharidàceæ.* This genus contains perhaps 9 species of aquatic herbs, including the Ditch-moss, an interesting hardy perennial plant found in slow streams and ponds nearly throughout North America, except the extreme north. It is particularly desirable for home and school aquaria. It is a slender, wholly submerged plant, with branching stems 4 in. to 3 ft. long, according to the depth of the water. The pistillate fls. are raised to the surface by their long calyx tubes, and float there. The minute staminate fls., which are rarely seen, commonly break off below, rise to the surface, float about, open, and shed their pollen. The fruit ripens below the surface, and the seeds rise. This plant is now found abundantly in Europe, being sometimes known in England as "Babington's Curse," from the man who introduced it. It reached England in 1841 and choked up many canals and waterways, notably the Cam. It was very abundant in 1852 and 1853, but declined in the next few years. Ducks, geese and swans are fond of it, and render great service in getting rid of it. It can be used for manure where it grows in sufficient quantities. Like many other water plants, it makes heavy buds in the fall (Fig. 759), which drop to the bottom and grow in the spring.

Canadénsis, Mich. (*Anácharis Canadénsis*, Planch. *A. Alsinástrum*, Bab.). Water-weed. Ditch-moss. Water Thyme. Water Pest. Lvs. in whorls of 3 or 4, or the lower ones opposite, linear, minutely toothed or not, 2–7 lines long, ½–2 lines wide: fls. white; calyx tube of the pistillate fls. 2–12 in. long; spathes 5–7 lines long. B.B. 1:93. W. M. Tricker and W. M.

ELÒDES. See *Hypericum.*

ELSHÒLTZIA (John Sigismund Elsholtz, author of an unpublished Flora Marcica, the MS. of which is in the Royal Library, Berlin) *Labiàtæ.* Herbs or undershrubs, in temperate and tropical Asia, with fls. in spikes: calyx tubular, 5-toothed; corolla oblique or 2-lipped, the upper lip 4-toothed in the typical species (described below), the lower longer and entire or somewhat crenulate; stamens 4, separated. One is in the Amer. trade.



760. Elsholtzia cristata.

cristàta, Willd. Fig. 760. Twelve to 18 in. high, with opposite, petioled, ovate-oblong toothed lvs. and small, light blue fls. in crowded, more or less 1-sided spikes: calyx enlarging in fr. Asia. B.M. 2560.—Hardy annual, with very aromatic foliage and attractive, upright habit. Said to be a good bee plant. L. H. B.

ÈLYMUS (Greek, *rolled up* or *enveloped*). *Gramíneæ.* Lyme Grass. Wild Rye. Erect perennial grasses, with flat or convolute lvs. and closely-fld. terminal spikes: spikelets 2–6-fld., often long-awned, the uppermost imperfect, sessile, in pairs (rarely in 3's or 4's), at the alternate notches of the continuous or articulate rachis, forming terminal spikes; empty glumes acute or awn-pointed, persistent and subtending the fls. like an involucre. Species about 20, in the temperate regions of Eu., Asia and N. Amer. For *E. Hystrix*, see *Asperella.*

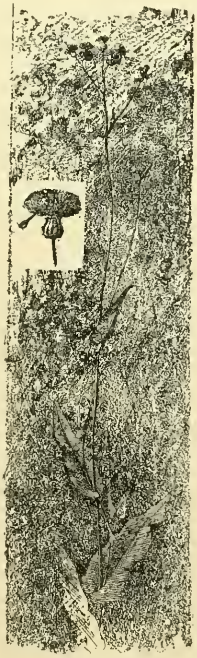
arenàrius, Linn. Sea Lyme Grass. Stout, coarse perennial, 2–8 ft. high, with strong, creeping rootstocks: lvs. long, rigid, smooth: spikes dense, terminal, 6–12 in. long; spikelets about 1 in. long and 3–4-fld.—One of the best grasses known for binding the drifting sands of our Atlantic and Pacific coasts, especially when combined with Beach Grass (see *Ammophila arenaria*). The seed is also used by the Digger Indians for food.

Canadénsis, Linn. Canada Lyme Grass. Terrel Grass. Rather stout, smooth perennial, 3–5 ft. high, with broad, flat lvs. 6–12 in. long: spikes 4–9 in. long, exserted, nodding; spikelets very rigid, 3–5-fld.: fl.-glumes long-awned. Common in low thickets and along streams in rich, open woods throughout the country.—Cult. as an ornamental plant. Var. **glaucifòlius,** Gray (*E. glaucifòlius*, Hort.), is pale and glaucous throughout, with usually more slender awns. Cult. as an ornamental grass.

condensàtus, Presl. Giant Rye Grass. The largest of the native Rye Grasses, growing to the height of 5–10 ft.: culms in dense tufts, stout: spikes 8 in. to 1½ ft. long, very variable, compact or interrupted, bearing branching clusters of spikelets at each joint. Common in the Rocky mountain regions and the Pacific slope.—Useful for binding the loose sands on railway banks. Cult. as an ornamental grass.

glaùcus, Regel. A glaucous-leaved, dense, cespitose, hardy perennial grass 3–4 ft. high, with very short, smooth lvs. and erect, elongated spikes: spikelets in 2's, erect, usually 5-fld., densely villous-pubescent, short-awned. Turkestan.—Rarely in cult. as an ornamental grass. P. B. Kennedy.

EMÍLIA (perhaps a personal name). *Compósitæ.* Herbs, perennial or annual: related to Senecio, but always without rays: heads rather small, the involucre very simple and cup-shaped, with no small outer scales: akenes with 5 acute ciliate angles: florets all perfect. A dozen or more species have been described from Africa, tropical Asia and Polynesia. One species in common cult.



761. Emilia flammea.
Separate head × ⅓.

flámmea, Cass. (*E. sagittàta*, DC. *E. sonchifòlia*, Hort., not DC. *E. sonchifòlia*, Linn., var. *sagittàta*, Clarke. *Cacàlia coccínea*, Sims, B.M. 564. *C. sonchifòlia*, Hort., not Linn. *C. sagittàta*, Vahl. *Senècio sagittàtus*, Hoffm.). Tassel Flower. Flora's Paint Brush. Fig. 761. A neat annual, erect, 1–2 ft., glabrous or sparsely hairy, the long stems terminated by clusters of small scarlet (golden yellow in the form called *Cacàlia lùtea*, Hort.) heads: lvs. lance-oblong or ovate-lanceolate, clasping the stem, remotely crenate-dentate: involucre scales much shorter than the florets. E. Ind., Philippines.—This much-named annual is one of the commonest garden flowers. It is of the easiest culture in any good soil. Blooms from July until frost, if sown as soon as weather is settled.

E. purpùrea, Cass. (E. sonchifolia, DC., not Hort. Cacalia sonchifolia, Linn. Senecio sonchifolia, Mœnch). Radical lvs. often more or less lyrate, stem lvs. broader and clasping, the heads fewer in the cluster and the involucre scales nearly as long as the florets. Apparently not in cult. in this country.

L. H. B.

EMMENÁNTHE (Greek, *enduring flower;* the persistent corollas retain their shape when dry like everlasting flowers). *Hydrophyllàceæ.* Half a dozen annual herbs from western North America, of which the most interesting species was introduced to cultivation in 1892, under the name of California Yellow or Golden Bells. It grows 9–12 in. high, forming bushy plants, each branch loaded with broadly bell-shaped, pendulous, unwithering flowers, about half an inch long, of creamy yellow. The general effect of a branch suggests the lily-of-the-valley, but the foliage is pinnatifid. The lasting character of the fl. distinguished the genus from its allies, the nearest of any garden value being Phacelia. Corolla lobes 5; stamens 5; style 2-cut. The species named below belongs to a section of the genus, with calyx lobes broader downward, and coarsely pitted seeds. All the others have the calyx lobes broader upwards and the seeds more or less wrinkled transversely.

penduliflòra, Benth. California Yellow or Golden Bells. Somewhat sticky, with long or short, soft hairs: lvs. pinnatifid, lobes numerous, short, somewhat toothed or sharply cut: ovules about 16: seeds 1 line long. Calif. G.C. III. 11:339. W. M.

EMPÈTRUM (Greek, *en*, in, *petros*, rock; growing often on rocks). *Empetràceæ.* Crowberry. Evergreen, hardy, prostrate or creeping, heath-like shrubs, with small, crowded lvs., inconspicuous purplish fls., and globose, red or black, edible berries. They grow best in moist, sandy or peaty soil, and are especially handsome for rockeries. Prop. usually by cuttings of nearly ripened wood in late summer under glass. One species through the northern hemisphere in mountainous and arctic regions, also in S. America. Lvs. generally linear, thick, alternate: fls. diœcious, small, 1–3 axillary, nearly sessile, 3-merous: fr. a 6–10-seeded drupe.

nigrum, Linn. Lvs. linear to linear-oblong, glabrous or nearly so, entire, ⅙–¼ in. long: fls. purplish: fr. black, about one-fifth in. in diam. Var. **purpùreum,** DC. Fr. red. Arctic and boreal N. Am. Var. **rùbrum,** DC. (*E. rubrum*, Vahl). Young branches and margins of lvs. villous, hence the plant grayish green: fr. red. Antarctic S. Am. B.R. 21:1783. Alfred Rehder.

ENCÈLIA (meaning obscure). *Compósitæ.* About 20 species of American herbs, chiefly western, often woody at base. The following was introduced by Franceschi, Santa Barbara, Calif., and has fls. 2½ in. across, with yellow rays and a black disk. Has probably never been tried in the East.

Califórnica, Nutt. Woody at base, 2–4 ft. high, strong-scented, rather hoary, or becoming green: lvs. 1–2 in. long, ovate to broadly lanceolate, usually entire, indistinctly 3-ribbed from the base, abruptly stalked: rays numerous, 2–4-toothed: seeds obovate, with long, silky hairs on the callous margins and a shallow notch at the tip.

ENCEPHALÁRTOS (Greek, *en*, within, *kephale*, head, and *artos*, bread; alluding to the bread-like interior of the trunk). *Cycadàceæ.* Grand cycads from tropical and southern Africa, grown chiefly for their splendid evergreen foliage. Nineteen or less species. The finest picture of an Encephalartos in any American periodical is probably that in Garden and Forest 4:209, accompanying an article from William Watson, of Kew, whose remarks are here condensed. These plants are specially suited for large conservatories, the fronds being not easily injured. They should succeed outdoors South. Some of the Kew specimens must be nearly a century old. The trunks of some kinds grow only a few inches in many years. The specimen illustrated had a stem 5 ft. in circumference, nearly 3 ft. high, and crowned by 107 leaves, each 3 ft. long, and rigid. A whorl of new leaves is produced each year, the latest one having 34 full sized leaves. The whole head was about 7½ feet in diameter. Most kinds prefer a sunny, tropical house, but *E. brachyphyllus* and perhaps others may be grown in a cool greenhouse if kept a little dry in winter. The cones are always interesting and often very decorative. Those of *E. villosus* are twice as large as a pineapple, orange-yellow, half-revealing the scarlet fruits.

Cycads are propagated by seeds; also by offsets or suckers. They are slow-growing, except in very warm houses. They like a strong, loamy soil. While making new growth they need plenty of water. See *Cycas*. The woolliness of the stem and leaf-segments varies with the age of the plants and of the leaves.

The pith and central portion of the cones of some species form an article of food among the Kaffirs, hence the common name of Kaffir Bread. The most widely known species in cultivation are *E. villosus*, *E. Altensteinii* and *E. pungens*. Though very handsome Cycads, they are by no means popular.

Some other Cycads frequently produce seed in conservatories, but Encephalartos seldom does, and plants are, therefore, usually imported. Dry trunks, weighing frequently from 50–75 pounds, have been received from South Africa. They often remain dormant for a year or more, and do not make ornamental specimens for two or more years.

In the following descriptions "rachis" refers to the midrib of the leaf on which the leaflets or segments are borne, and "petiole" means the portion of the leaf below where the leaflets begin.

A. *Leaflets toothed (sometimes entire in No. 1).*

B. *Petiole 4-angled: foliage glaucous, i. e., covered with plum-like "bloom."*

1. **hòrridus**, Lehm. Trunk woolly or not: leaflets opposite or alternate, lanceolate, mostly entire, sometimes toothed. Var. **glaúca** is presumably more glaucous than the type. B.M. 5371.

BB. *Petiole sub-cylindrical: foliage not glaucous.*

C. *Leaves dark green: trunk not woolly.*

2. **Áltensteinii**, Lehm. Leaflets mostly opposite, lanceolate. B.M. 7162–3. G.C. II. 6:392, 393, 397; III. 2:281; 12:489–93.

CC. *Leaves light green: trunk woolly.*

3. **villòsus**, Lehm. Leaflets opposite or alternate, linear-lanceolate. B.M. 6654. R.H. 1897:36. G.C. II. 1:513; 3:400; 7:21; 13:181.

AA. *Leaflets not toothed (except in young lvs. of Nos. 8 and 9, and also in No. 1).*

B. *Foliage glaucous.*

4. **Léhmanni**, Lehm. (*Cy̆cas Léhmanni*, Hort.). Trunk not woolly: rachis and petiole obtusely 4-angled; leaflets nearly opposite, narrowly or broadly lanceolate, rarely 1-toothed. Gt. 1865:477.

BB. *Foliage not glaucous.*

C. *Apex of leaflets mostly obtuse, pointless.*

5. **longifòlius**, Lehm. Trunk not woolly, at length tall: rachis and petiole 4-cornered but flattish above: lowest leaflets often 1–3-toothed, margin somewhat revolute: wool soon vanishing from the rachis and leaflets. Var. **revolùtus**, Miq., has the margins more distinctly revolute. Var. **angustifòlius** has narrower, flat leaflets. Var. **Hoòkeri**, DC., has narrowly lanceolate leaflets, not glaucous but intense green, and rachis not woolly. B.M. 4903, erroneously named *E. Caffer*, is referred to this place by a recent specialist, though the leaflets are distinctly pointed in the picture.

CC. *Apex of leaflets always strong-pointed.*

D. *Form of leaflets linear.*

E. *Margin of leaflets revolute.*

6. **cycadifòlius**, Lehm. (*E. Friderici-Guiliélmi*, Lehm. *E. cycadifòlius*, var. *Friderici-Guiliélmi*, Rod.). Trunk woolly at first: rachis and petiole ashy-pubescent: leaflets opposite and alternate, linear. I.H. 29:459. G.F. 4:209.

EE. *Margin of leaflets not revolute.*

7. **púngens**, Lehm. (*Zàmia púngens*, Ait.). Rachis and petiole glabrous: leaflets long-linear, dark green, rigid, flat, striated beneath. Var. **glaúca** is also sold.

DD. *Form of leaflets lanceolate.*

E. *Rachis glabrous.*

8. **Cáffer**, Miq. (*E. Cáffra*, Hort.). Petiole 3-angled: leaflets alternate, narrower at the base, twisted, the younger ones with 1 or 2 teeth. R.H. 1869, p. 233. Not B.M. 4903, which is *E. longifolius*, var. *Hookeri*.

EE. *Rachis spidery-pubescent.*

9. **Cáffer, var. brachyphy̆llus**, DC. (*E. brachyphy̆llus*, Lehm.). Rachis and blades of the lower leaflets spidery-pubescent: male cones sessile instead of peduncled. The pinnæ are erect, and longer and narrower than in *E. Caffer*.

W. M., P. J. Berckmans and W. H. Taplin.

ENCHOLÍRIUM. Consult *Tillandsia*.

ENDIVE (*Cichòrium Endívia*). *Compósitæ*. See *Cichorium*. During summer and fall, well-blanched heads of Endive may be found in all our large city markets, and are appreciated to some extent, especially among the foreign part of our population. We seldom see Endive in American home gardens, or in small local markets. In the absence of lettuce during the latter part of the season, Endive serves as an acceptable salad, and is well worthy of greater attention than it receives, especially as it is of easy culture. Select any ordinary good garden soil. Sow seed thinly in drills, which need not be more than a foot apart, but thin the plants promptly to about the same distance in the rows, and keep free from weeds, and also well cultivated and hoed. When the plants have attained nearly their full growth, gather up the leaves and tie them lightly at their tips (Fig. 762). In from two to three weeks' time, according to weather conditions, the heart will blanch beautifully, and the plant should then be promptly used or marketed, as decay sets in soon after this stage of development. The blanching may also be done by slipping a large-sized but short tile or piece of tile over each plant, after the leaves are gathered up and held closely together.

762. Green Curled Endive tied up for blanching.

The varietal differences are slight, and consist mostly in variations of form of leaves. The standard variety grown in America is called Green Curled. In European catalogues we find a number of varieties listed and described. Among them Moss Curled, Rouen, and Broad-leaved are the most popular. T. GREINER.

ENEMIES. This word is found increasingly useful to include the work of Insects and Diseases, which see. Also consult *Spraying* and *Tools*.

ENKIÀNTHUS (Greek words, referring to shape of the Andromeda-like flowers). Also written *Enkyanthus*. *Ericàceæ*. A genus of 5 species of shrubs, allied to our familiar Andromeda, Zenobia and Pieris (the last of which it most resembles in habit), and distinguished from these genera by the obtuse anthers, 2-horned at the top on the back, and long pores: seeds 3–5-winged. China, Japan and Himalayas. *E. Japonicus* is very showy in autumn, with its brilliant yellow foliage more or less marked with red, and its strongly contrasting brown capsules. In early spring it bears numerous umbels of Andromeda-like fls. Pot-grown plants are obtained through dealers in Japanese plants. The species is hardy as far north as Washington, D. C., and perhaps farther. Enkianthus is a genus of glabrous shrubs: branchlets somewhat whorled: buds furnished with deciduous bracts: lvs. stalked, leathery and evergreen or membranous and deciduous, entire or minutely toothed: fls. in terminal umbels, white, rosy or scarlet, drooping or merely nodding; calyx small, 5-cut; corolla urceolate or broadly bell-shaped, with 5 spreading or reflexed lobes; stamens 10: ovary 5-celled. Four kinds are grown abroad under glass. Equal parts of loam and peat, and careful potting, are advised. Prop. by cuttings of ripe wood, inserted under glass in spring without heat; also, by layering out of doors.

Japónicus, Hook. Lvs. crowded at the ends of branchlets, 1½–2 in. long, short-stalked, obovate when young, ovate when older, acute, serrulate, deciduous: fls. drooping, pure white; pedicels 8 lines long, glabrous; corolla globose, with 5 sacs at the base, a contracted mouth, and 5 small, revolute lobes: capsule narrow, erect. Japan. B.M. 5822. R.H. 1877, p. 467. G.C. III. 21:357.

E. campanulàtus, Nicholson. Fls. terminal, drooping, in short racemes, dark red throughout, without sacs at the base; pedicels sometimes minutely hairy, 6–9 lines long: corolla 4 lines across, with 5 erect lobes. In the forests of Japan sometimes 30 ft. high. Has brilliant foliage. Northern Jap. B.M. 7059. R.H. 1888, p. 512 (as E. Himalaicus).—*E. Himalàicus*, Hook. Lvs. 2–3 in. long, narrower above the middle and more tapering than in E. Japonicus, acuter at the base, pubescent beneath when young: fls. drooping, 6–14 in an umbel; pedicels hairy: corolla dull yellowish red, streaked brighter red, without sacs at the base, and erect lobes. B.M. 6460. The bright red petioles and leaf-margins are possessed to a lesser degree in the next species, but this has yellowish pedicels and the next species red ones.—*E. quinqueflòrus*, Lour. Lvs. longer-petioled than in the rest, oval, and more abruptly pointed; calyx colored like the corolla instead of green, as in the other kinds: fls. drooping, scarlet, sometimes white at tips, with 5 sacs, which are shorter than in E. Japonicus. R H. 1849:221. B.M. 1649. B.R. 11:884–5. The buds are particularly interesting. W. M.

ENTÀDA (a Malabar name). *Leguminòsæ*. A genus of 13 species of tropical, woody, spineless climbers, with bipinnate lvs. White fls., in spike-like racemes. One kind has lately been introduced from the West Indies to the southern states. It makes a quick growth. Petals free or slightly cohering, valvate: stamens 10, free, exserted: anthers crowned with a deciduous small gland: ovary many-ovuled. The lvs. often bear tendrils. Some of the species yield "Sea Beans" (G. F. 7:503).

polystàchya, DC. At length tendril-bearing: pinnæ in 4–6 pairs: lfts. in 6–8 pairs, oblong, rounded at apex: racemes in terminal panicles: pod oblong, straightish. Trop. Amer.

ENTELÈA (Greek, *complete;* the stamens all fertile, a distinguishing feature). *Tiliàceæ*. Perhaps 3 species of trees from New Zealand and Tahiti. The following is said to be an extremely fast grower in S. Calif., and is cult. abroad under glass, but, from the picture cited, it seems not worth the space in northern greenhouses. Lvs. 5-nerved, stellate-pubescent: fls. white, in terminal cymes; sepals 4–5; petals 4–5; stamens numerous, free: ovary 4–6-celled; cells many-ovuled: style simple.

arborèscens, R.Br. Attaining 30 ft.: the heart-shaped outline of the leaf broken on each side, about two-thirds of the way toward the tip, by a projection ½in. long or nearly as long as the tip of the leaf: lvs. 6 in. long, 4 in. wide, doubly serrate. New Zeal. B.M. 2480.—Int. by Franceschi.

ENTEROLÒBIUM (meaning not obvious). *Leguminòsæ*. Six species of tropical trees, of which 2 have been introduced into S. Calif. Unarmed: lvs. bipinnate: fls. greenish, in large heads or clusters; corolla 5-toothed; stamens any number up to 10, purple or white.

A. *Pod bent back in a complete circle.*

cyclocárpum, Griseb. Pinnæ in 4–9 pairs: lfts. in 20–30 pairs, unequal-sided, oblong, pointed. Cuba, Jamaica, Venezuela.

AA. *Pod forming half or two-thirds of a circle.*

Timboùva, Mart. "A truly magnificent tree, with shining bark and spreading head, sure to become popular in the South. Hardy at Naples, Italy."—*Franceschi.*

EOMÈCON (Greek, *eastern poppy*). *Papaveràceæ*. A rare, hardy herbaceous perennial plant with white fls., destined to no great popularity, but interesting to lovers of hardy borders. Hooker writes: "A beautiful monotypic genus, intermediate between Stylophorum and Sanguinaria, differing from both in the scapose habit, racemose fls. and sepals confluent in a membranous, boat-shaped spathe, and further from Stylophorum in the form of the lvs. and color of the fls., and from Sanguinaria in the four petals and elongate style." The plant is hardy with Woolson at Passaic, N. J.

chionántha, Hance. Rootstock creeping, ascending, full of yellow sap: lvs. all from the root; stalks twice as long as the blades; blades 3–6 in. long, heart-shaped, concave, broadly sinuate, rounded at the apex, bright pale green above, almost glaucous beneath: scape 1 ft. high, reddish: fls. 2 in. across, white; petals 4. Spring. China, not Japan. B.M. 6871. W. M.

EOPÈPON. See *Trichosanthes.*

ÉPACRIS (Greek-made name, *upon the summit;* referring to their habitat). *Epacridàceæ*. About 25–30 heath-like shrubs of Australia, New Zealand, etc., of which half a dozen or less are grown as cool greenhouse pot-plants. Lvs. small and entire, usually sharp-pointed, sessile or short-stalked, scattered or sub-opposite: fls. small and axillary, short-stalked, the flowering stems being elongated leafy spikes. The fls. are regular and perfect; calyx bracteate; corolla tubular, 5-toothed, white or shades of purple and red; stamens 5: ovary 5-loculed, ripening into either a fleshy or capsular fruit. Distinguished from Ericas by the bracteate or scaly calyx, and the anthers opening by slits rather than pores. In the Old World, Epacrises are prized by those who grow heaths, and many good varieties are known. They bloom in early spring or late winter. The varieties of *E. impressa* may be flowered for Christmas; perhaps others may be so treated. A carnation house, 50°–55°, suits them well. There are double-fld. forms. The most important to the horticulturist are:

impréssa, Labill. Three ft., erect, twiggy, downy: lvs. horizontal or deflexed, narrow-lanceolate and sharp: fls. rather large (often ½ in. long), tubular, pendent, on very short stalks, red or white. B.M. 3407. There are many forms: var. **parviflòra,** Lindl., B.R. 25:19; *E. campanulàta*, Lodd., with broader fls., L.B.C. 20:1925; *E. ceræflòra*, Grah., B.M. 3243; *E. nivàlis*, Lodd., snow white, L.B.C. 19:1821, B.R. 18:1531; *E. variàbilis*, Lodd., blush, L.B.C. 19:1816; **longiflòra,** Cav. (*E. miniàta*, Lindl. *E. grandiflòra*, Willd.). Stems woolly, straggling: lvs. ovate-pointed or cordate-pointed, sessile or nearly so, many-nerved: fls. long (nearly 1 in.), red at base and white at the limb, cylindrical. B.M. 982. B.R. 31:5.—Handsome. Var. **spléndens,** Hort., has brighter colors.

acuminàta, Benth. Lvs. ovate, acuminate, clasping, ascending: fls. small, red, the corolla tube not much exceeding the calyx.

purpuráscens, R. Br. Lvs. ovate-acuminate, trough-shaped, tipped with a long curved point or spine: fls. short, the calyx nearly equaling the corolla, white or pinkish. There is a double-fld. form. L.B.C. 3:237. G.C. II. 5:340.—Probably identical with *E. pulchella*, Cav.

obtusifòlia, Smith. Lvs. small, elliptic or linear, thick and obtuse: fls. small, white, the spikes more or less one-sided. L.B.C. 3:292.

Other trade names are *E. ardentissima*. Fls. crimson.—*E. hyacinthiflòra*, var. *candidissima*, white, early, and var. *fulgens*, pink.—*E. hybrida superba* is merely a catalogue name for mixed kinds of Epacris.—*E. rubèlla*. Fls. bright red.—*E. salmònea*.
L. H. B.

The genus Epacris (though perhaps not as well known as the Ericas, with which they are usually grown, requiring the same culture) furnishes the cool greenhouse with some of the most beautiful hard-wooded flowering plants known, the fls. embracing a good range of color. Where a good variety of these plants is grown, the flowering period extends from the end of January to the end of April. After flowering, the upright or bushy species should receive whatever pruning may be necessary to secure a well-shaped plant, while the pendulous varieties will require the shortening of only the strongest branches to induce a more even growth. If necessary, potting should be done at this time, and those which do not need repotting should have the drainage of their pots made perfect, as a water-logged condition of the soil is fatal to these plants. The soil best suited to them is two parts good fibrous peat, one part leaf-mold, and one part silver sand. In potting, small shifts should be given and the soil pressed as firmly as possible in the pots. After potting and pruning, the plants should be placed in a temperature of 60–65°, and syringed on all fine days to encourage fresh growth. During the summer they should be placed outside, in a position where they would receive some shade during the hottest part of the day, and the pots should be plunged in ashes or other non-conducting material. Careful watering is necessary at all times with these plants. If allowed to become dry, they will lose their lower lvs., which spoils their appearance; at the same time a saturated condition of the soil is fatal to them. Though they may be propagated by seeds, the use of cuttings of the young growth is more expeditious. These should be about 1 inch in length and the tip ends of the young growths. They may be inserted thickly in pans of sharp silver sand, with a glass bell-jar placed over them to keep them close. The pans should be plunged in the propagating bed and the cuttings carefully watered and shaded till rooted. The moisture which collects in the bell-jars should be wiped out two or three times a day, and a little ventilation from the bottom admitted after about the third day, removing the bell-jars altogether as the cuttings become rooted, which usually takes two or three weeks. When nicely rooted, they should be potted singly into thumb-pots and grown along, pinching when necessary to induce a bushy habit.
Edward J. Canning.

It is a good plan to plunge pots of Epacris in an open position and cover the plants during June and July with lath racks. About August, begin to remove the racks a few hours each day until the middle of September. Then remove the racks altogether. This practice hardens the wood and insures the setting of buds. A top dressing is a great help to Epacris and all hard-wooded plants. Hay or straw, run through a hay cutter, makes the best dressing. It can be put on quickly and evenly; it protects from the sun; it is light; it dries quickly, and has no bad effects, as manure does in the case of some hard-wooded plants. The writer has found the following sorts do well: Diadem, Eclipse, Her Majesty, Model, Rose Perfection, hyacinthiflora and vars. candidissima and fulgens, impressa alba, miniata vars. superba and splendens, rubra superba.
H. D. Darlington.

EPHÈDRA (ancient Greek name, used by Pliny for the Horse-tail). *Gnetàceæ*. Generally low, much-branched shrubs, often procumbent and sometimes climbing, the green branches resembling much those of Equisetum, bearing minute, scale-like, sheathing lvs. in distant pairs or whorls: fls. inconspicuous, but fr. in some species decorative, berry-like and scarlet. They are but rarely grown, and most of them are tender; half hardy North are *E. distachya*, *foliata*, *Nevadensis*, *trifurca*. They can be used for covering dry, sandy banks or rocky slopes, and are prop. by seeds or by suckers and layers. About 30 species from S. Europe, N. Africa, Asia and in extra trop. Amer. Fls. diœcious, in small aments, forming usually peduncled axillary clusters; staminate fl. with a 2–4-lobed perianth and with the 2–8 stamens united into a column; pistillate fl. with an urceolate perianth, including a naked ovule, developing into a nutlet; in some species the bracts of the ament become fleshy, and form a berry-like syncarp. Latest monograph by O. Stapf, in Denkschr. Akad. Wissensch., Wien, Vol. 56 (1889), (in German and Latin).

E. distàchya, Linn. (E. vulgaris, Linn.). Low, often procumbent, 1–3 ft., pale or bluish green: lvs. one-twelfth in. long: aments usually clustered, staminate oblong: fls. with about 8 stamens, pistillate 2-fld.: fr. berry-like. S. Europe, W. Asia. Var. monostachya, Stapf. Aments usually solitary.—*E. foliàta*, Boiss. (E. Kokanica, Rgl.). Procumbent or erect, to 15 ft., bright or bluish green: lvs. ⅛-1-10 in. long: aments usually clustered, ovate; staminate-ovate fls. with 3–4 stamens; pistillate 2-fld.: fr. berry-like. W. Asia.—*E. Nebrodènsis*, Tineo. Erect, with rigid, pale green branches: lvs. ⅛ in. long: aments solitary or few; staminate globular; pistillate 2-fld.: fr. berry-like. Mediterr. region to Himal.—*E. Nevadènsis*, Wats. Erect, 2–3 ft., with pale or bluish green branches: lvs. ⅛ in.: aments usually solitary; staminate ovate 6–8-fld.; pistillate 2-fld.: fr. dry, with ovate bracts. Calif., New Mex.—*E. trifúrca*, Torr. Erect, with rigid, yellowish or pale green branches: lvs. in 3's, connate, about ¼ in. long: aments solitary; pistillate 1-fld.: fr. dry, the roundish bracts with transparent margins. Arizona to Colorado.
Alfred Rehder.

EPIDÉNDRUM (*upon trees*, alluding to their epiphytal habit). *Orchidàceæ*, tribe *Epidéndreæ*. Epiphytes: inflorescence simple or branched, nearly always terminal: claw of the labellum more or less adnate to footless column, the blade spreading and usually deeply lobed: pollinia 4, 2 in each anther cell, separated. Nearly 500 species discovered and described from central America.

Epidendrums are noted as the rankest weeds amongst the orchid tribes. The remarkable success in the raising of hybrids, be it in the genus itself, or with the related Cattleya and Lælia, has opened a wide field for the hybridist. Epidendrum seedlings grow freely; the time required to bring them to the flowering stage is little compared with other orchids, and it is but a question of a short time till the blood of the Epidendrums will be infused into the weaker but more gorgeous flowers of genera more difficult to grow. It is also the long stem and the grace of the racemes of the Epidendra, as well as the odor of some of their species, which the hybridist will try to blend with the largeness of short-stemmed flowers, of Cattleyas for instance. We therefore give below a list of the species but rarely found under cultivation, but the value of which will call for and justify large importations of their kind before long.
George Hansen.

It is scarcely possible to apply any one rule for the cultivation of this widely divergent and large genus, which includes many hundreds of variable individuals geographically distributed all over tropical America. For convenience they are treated under their several separate sections.

Section I.—**Barkeria** embraces several deciduous, small-growing species which generally deteriorate sooner or later under cultivation. They succeed best in small baskets, suspended from the roof in rough, loose material, such as coarse peat fiber, with a small quantity of live chopped sphagnum moss added to retain moisture, this compost freely interspersed with pieces of charcoal or broken crocks or potsherds. They are all subjects for the coolhouse, require a free, moist atmosphere, shade from the sun while growing, and must be syringed frequently overhead in bright weather. After the plants have matured growth they should be removed to a rather sunny location and be syringed overhead often enough to keep them in sound condition until they start new action. While resting during winter the temperature may range from 50° to 55° Fahr. at night, and a few degrees higher during the day. They are increased by division. This should take place as the plants start growth action in early spring, allowing at least three pseudobulbs to each piece.

Section II.—**Encyclium**, of which *E. atropurpureum*, *E. nemorale* and *E. prismatocarpum* are good examples, may be grown either in pots or baskets in equal parts clean peat fiber and live chopped sphagnum, with a liberal amount of drainage, and excepting *E. vitellinum*, which must be grown cool, they require a moist, sunny location with a winter temperature of 58° to 65° Fahr. by night and several degrees advance during the day. In February and March, many species will start root or growth action; such as need it should then be repotted or top-dressed, as occasion requires. The temperature should be increased several degrees, and a greater amount of water be allowed with frequent overhead syringing on bright days. Ventilation should be given whenever the weather will permit, to keep the young growths from damping-off and the atmosphere active; at this time the plants will need light shading to prevent sun-burning. The stock is increased by cutting nearly through the rhizome 3 or 4 bulbs behind the lead, when starting action; this will generally cause the latent eyes to grow, but the pieces should not be removed until the new growth is well advanced.

Section III.—**Aulizeum** includes such species as *E. ciliare*, *E. cochleatum*, etc., the several requirements being identical with the preceding.

Section IV.—**Euepidendrum.** These are mostly tall growing reed-like species, of which *E. evectum* and *E. radicans* afford good illustrations. They are best adapted for pot culture. The pots should be two-thirds filled with drainage and the compost—consisting of about equal parts peat fiber and live sphagnum, well mixed—pressed in firmly about the roots, leaving the surface raised a little above the rim in the center when finished, to shed off surplus water. While the plants are growing they require a shaded, moist location, a day temperature of about 75° Fahr., with 5 or 10 degrees less at night. They should not be kept too wet at the roots, but overhead syringing in bright weather is very beneficial. While at rest, in winter the temperature should be modified 10 degrees and a more sunny location be given, with less frequent syringing, enough only to keep the canes or pseudobulbs in sound condition. Young plants often form in the axils of the upper leaves, and on the old flower stems it is best to let these young plants remain until they start their second growth, as they can be more safely removed at that time.

Section V.—**Psilanthemum** contains but one species, *E. Stamfordianum*, which requires the same general treatment as those in Section II. ROBERT M. GREY.

INDEX.

atropurpureum, 15.
aurantiacum, 27.
bicornutum and bidentatum are Diacriums.
Brassavolæ, 16.
Capartianum, 20.
Catillus, 2.
ciliare, 23.
cinnabarinum, 3.
cochleatum, 24.
crassifolium, 5.
dichromum, 17.
elegans, 11.
evectum, 7.
eburneum, 4.
ellipticum, 5.
Endresii, 6.
falcatum, 25.
fragrans, 26.
Godseffianum, 20.
imperator, 2, 8.
leucochilum, 8.
Lindleyanum, 13.
maculatum, 21.
macrochilum, 16.
nemorale, 18.
odoratum is an Ærides.
osmanthum, 19.
paniculatum, 9.
Parkinsonianum, 25.
prismatocarpum, 20.
radicans, 10.
rhizophorum, 10.
roseum, 15.
sanguineum is a Broughtonia.
Skinneri, 12.
spectabile, 14.
Stamfordianum, 1.
tibicinus is a Schomburgkia.
venosum, 22.
violaceum is *Cattleya Loddigesii*.
vitellinum, 21.

A. *Inflorescence radical. (Psilanthemum.)*

1. **Stamfordiànum**, Batem. Stems fusiform, 12 in. long: lvs. 7–9 in.: large panicles of yellow and green fls., crimson spotted, fragrant. Mexico to New Granada. B.M. 4759. G.C. III. 17:655.

AA. *Inflorescence terminal.*

B. *Stems without bulbs: leaves distichous, alternate: only top of column free from lip. (Euepidendrum.)*

2. **Catillus**, Reichb. f. (*E. imperàtor*, Hort.). Fls. cinnabar red. New Granada. I.H. 21:162.

3. **cinnabarinum**, Salzmann. Stems 3–4 ft.: fls. orange-red, 2 in. in diam., lobes of lip deeply fringed. Beautiful species. Braz. B.R. 28:25.

4. **ebúrneum**, Reichb. f. Stems terete, 2–3 ft.: fls. 3–4 in. in diam., yellowish green; lip ivory white, with yellow calli. Panama, in swamps. B.M. 5643.

5. **ellípticum**, Graham (*E. crassifòlium*, Hook.). Fls. on long scapes, clustered, rose or purple, ½ in. in diam. Braz. B.M. 3543.

6. **Éndresii**, Reichb. f. Stems 6–9 in.: racemes 9–12-flowered: fls. 1 in. in diam., pure white; lip and column spotted purple. Costa Rica. G.C. II. 23:504.

7. **evéctum**, Hook. Stems 3–5 ft.: peduncles nodding, 2 ft.: fls. rich purple, lip deeply fringed. New Granada. B.M. 5902.

8. **leucochílum**, Klotzsch (*E. imperàtor*, Hort.). Stems 2 ft.: fls. 5–9, on long pedicels, greenish yellow, lip pure white. New Granada, 6,000–9,000 ft.

9. **paniculàtum**, Ruiz & Pav. Stems 3–4 ft.: fls. ¾ in. across, lilac-purple, lip whitish yellow. Venezuela to Peru, high altitudes. Most free-flowering and best of paniculate species. B.M. 5731. I.H. 22:211.

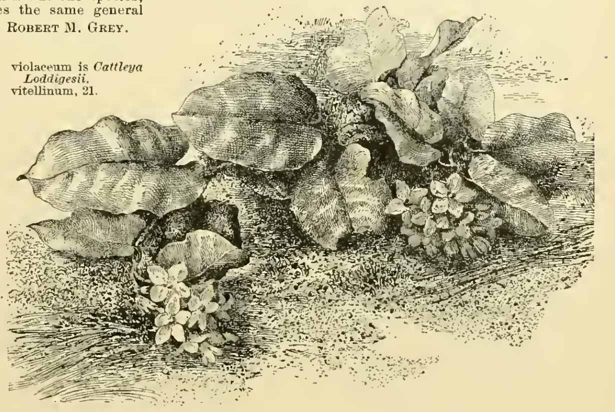
10. **radicans**, Pavon (*E. rhizóphorum*, Batem.). Stems semi-scandent, up to 5 ft. long, long white roots from opposite the leaves: fls. up to 2 in. in diam., numerous; most brilliant of the red-flowering species. Guatemala, amongst heavy grass. Gn. 24:412.

BB. *Stems thickened into pseudobulbs.*

C. *Pseudobulbs 2–4-leaved: labellum adnate less than half: column broad-winged. (Barkeria.)*

11. **élegans**, Reichb. f. (*Barkèria élegans*, Knowles & Westc.). Stems terete, 12 in.: pedicels 24 in.: fls. 5–7, nodding, 1½ in. in diam., lilac-purple; lip whitish, with purple blotch. Pacific coast of Mexico. B.M. 4784.

12. **Skinneri**, Bateman (*Barkèria Skínneri*, Paxt.). Lvs. ovate-oblong, sheathing the slender stem: peduncle terminal, bearing rose-lilac flowers about 1 in. across: petals and sepals nearly equal, petals so twisted at the base as to present dorsal surface to the observer: labellum ovate, with 3 raised lines. Guatemala. B.R. 22:1881. P.M. 15:1 (var. *major*).



763. Trailing Arbutus or Mayflower. (See Epigæa, page 535.)

13. **Lindleyànum**, Reichb. f. (*Barkèria Lindleyàna*, Batem.). Stems slender: fls. numerous, about 2 in. across, rose-purple; labellum with a white disk; petals broader than the sepals. Central America, 1839.

14. **spectábile**, Reichb. f. (*Barkèria spectábilis*, Batem.). FLOR DE ISABAL. Stems tufted, cylindrical, 4–5 in. high: lvs. 2: raceme about 6-fld.: fls. 3–4 in. across, bright lilac; sepals linear-lanceolate; petals ovate-lanceolate; labellum white at base, red-spotted. Guatemala.

CC. *Pseudobulbs 1–2-, rarely 3-leaved, labellum adnate at base, or not up to the middle, column not winged. (Encyclium.)*

15. **atropurpùreum**, Willd. (*E. macrochìlum*, Hook.). Pseudobulbs ovoid, 3–4 in. high: lvs. lanceolate, 12–15 in. long, dull purple colored: peduncle 6–10-fld.: fls. 2½ in. in diam., purplish brown upon greenish ground; lip yellowish white, with crimson stripes. Mex. to Venezuela. B.M. 3534. A.F. 6:609.

var. **ròseum**, Reichb. f. Sepals and petals purplish, lip bright rosy. Guatemala. P.M. 11: 243.

16. **Brassávolæ**, Reichb. f. Pseudobulbs pear-shaped: lvs. 6–9 in.: racemes 18–24 in., 6–9-fld.: fls. 4 in. across, sepals and petals narrow, yellowish brown; lip trowel-shaped, purple, white and green. Mex. to Guatemala, 8,000 ft. B.M. 5664.

17. **dichròmum**, Lindl. Fls. white, lip rose-colored, yellow and downy at base. Brazil.

18. **nemoràle**, Lindl. Pseudobulbs sub-globose, 3–4 in. high: lvs. 9–12 in.: peduncles 2 ft. long, covered with warts: fls. 3–4 in. in diam., rose-colored; lip rosy mauve, streaked with purple. Mex. B.M. 4606. G.C. II. 24:332. A.F. 6:633.

19. **osmánthum**, Rodrigues (*E. Godseffiànum*, Rolfe. *E. Capartiànum*, Lindl.). Fls. 1½ in. across, in large panicles, light green, suffused with brown; lip white, lined with rose-purple, fragrant. Braz.—One of the handsomest species.

20. **prismatocárpum**, Reichb. f. (*E. maculàtum*, Hort.). Pseudobulbs ovoid, tapering, 4–5 in.: lvs. 12–15 in.: fls. 1½ in. across, pale yellow-green, with purplish black spots; lip pale purple, with yellow tip and white border. Cent. Amer., 5,000 ft. B.M. 5336.

21. **vitellìnum**, Lindl. Pseudobulbs ovoid, 2 in. long: lvs. 6–9 in.: peduncles 15–18 in., 10–15-flowered: fls. cinnabar-red; lip and column orange. Mex., 6,000–9,000 ft. B.M. 4107. G.C. III. 10:141.

Var. **màjus**, Veitch. Pseudobulbs shorter: racemes denser: fls. larger and more brilliant. G.C. III. 12:159.—Very superior to the species; type no longer imported.

CCC. *Pseudobulbs 1–2-, rarely 3-leaved: lip adnate up to apex of column. (Aulizeum.)*

22. **venòsum**, Lindl. BUTTERFLY ORCHID. Scape 1 ft., with white sheaths: lvs. 3, 4–6 in. long, linear-lanceolate: scape tumid at base, 5–7-fld.: fls. pink, chocolate and green, about 1 in. long, lasting a long time. On oaks, etc., Mex.—Of easy culture. The Florida representative of this species is *E. Tampense*, Lindl. See 9th Rept. Mo. Bot. Gard. 137, plates 38, 39.

23. **ciliàre**, Linn. Pseudobulbs clavate, 4–6 in.: lvs. 4–6 in., springing from sheathing bract: peduncles 5–7-flowered: fls. yellowish green; lip white. Tropical America, between 5th and 20th parallel of north latitude. B.R. 10:784.—Plant resembles a Cattleya. Introduced to cult. in 1790.

24. **cochleàtum**, Linn. Pseudobulbs 3–4 in.: lvs. 6 in.: racemes 4–7-flowered: fls. 3–4 in. across, greenish white; lip deep purple beneath, light green above, with maroon blotch on each side, column white. Trop. Amer. from Fla. to New Granada. B.M. 572.—Introduced 1787, first epiphytical orchid to flower in England.

25. **falcàtum**, Lindl. (*E. Parkinsoniànum*, Hook.). Pseudobulbs thin, raising from running rhizomes, monophyllous: lvs. 6–12 in., fleshy, channeled on one side: peduncles 2–5, sheathed, 1-flowered: fls. 5 in. across, greenish yellow; lip white, greenish at apex. Mex. to Guatemala. B.M. 3778.—Plants grow inverted.

26. **fràgrans**, Swartz. Pseudobulbs fusiform, monophyllous, 3–4 in.: lvs. 8–12 in.: fls. inverted, 2 in. in diam., very fragrant, pale greenish or whitish; lip crimson streaked. Guatemala, through the West Indies to northern Brazil. B.M. 1669.

27. **aurantiacum**, Batem. Once classed in the separate group of Epicladium, now often accepted as a species of Cattleya, where it was first referred by Don. The plant grows with, and much resembles *Cattleya Skinneri*. Fls. 1½ in. across, orange-red. Guatemala.

Garden hybrids: *E. Bérkeleyi* (Stamfordianum × O'Brienianum).—*E. Búrtoni* (O'Brienianum × Ibaguense).—*E. Dellènse* (xanthinum × radicans).—*E. elegàntulum* (Wallisii × Endresio-Wallisii). G.C. III. 19:361.—*E. Endresio-Wállisii.*—*E. O'Brieniànum* (evectum × radicans). G.C. III. 3:771.—*E. Phœbus* (O'Brienianum × vitellinum).—*E. radicànti-Stamfordiànum.*—*E. rádico-vitellìnum.*—*E. Wállisio-ciliàre.*—*E. xàntho-radìcans.*

Euepidendrum: *E. arachnoglóssum*, André. Sts. 4–5 ft.: fls. rich purple-lilac; lip fringed, with orange calli. New Granada. R.H. 1882:554.—*E. cnemidóphorum*, Lindl. Sts. 4–6 ft.: racemes ample, drooping: fls. purple, brown and yellow, fragrant. Guatemala, 7,000 ft. B.M. 5656.—*E. conópseum*, R. Br. Scape few- to many-fld.: lvs. 1–3, thick: fls. green, tinged with purple, the sepals spatulate and revolute, the petals narrower and obtuse. S. Fla. and S. Once offered by Reasoner.—*E. Cooperiànum*, Batem. Sts. 2–3 ft.: fls. yellow-green; lip bright purple. Braz. B.M. 5654.—*E. Ellisii*, Rolfe. Fls. carmine-rose, very handsome. Columbia.—*E. fúlgens*, Brongn. Fls. orange-scarlet, in crowded racemes. Guiana to Braz.—*E. grácilis*, Lindl., was once offered by John Saul.—*E. Ibaguènse*, H.B.K. Sts. 2–3 ft.: fls. orange-scarlet; lip yellow. New Granada to Peru, 4,500 ft.—*E. myriánthum*, Lindl. Sts. 3-5 ft.: enormous panicles of rich purple fls.; lip with 2 yellow calli. Guatemala. B.M. 5556. Once offered by Saul.—*E. noctúrnum*, Linn. Sts. 2–3 ft.: peduncles 8–10-flowered: fls. white and yellowish, 5 in. across, very fragrant. S. Fla. and Mexico to Peru and West Indies. B.M. 3298. Once offered by Reasoner.—*E. palpígerum*, Reichb. f. Fls. beautiful lilac. Mexico.—*E. Pfavii*, Rolfe. Sts. 4–6 ft. high: fls. light purple; lip with white disk, in numerous racemes. Costa Rica.—*E. Pseudepidéndrum*, Reichb. f. Sts. 2–3 ft.: fls. 3 in. in diam., green; lip orange-red and yellow. Cent. Amer., 4,000 ft. B.M. 5929.—*E. raniferum*, Lindl. Sts. 2–3 ft.: fls. yellow-green, thickly spotted with purple. Mex. to Guiana. B.R. 28:42.—*E. rígidum*, Jacq., was once catalogued by Reasoner.—*E. Schómburgkii*, Lindl. Sts. 2–3 ft.: fls. vermilion. Guiana, Brazil, Quito. B.R. 24:53.—*E. syringothýrsis*, Reichb. f. Sts. 4–5 ft.: fls. deep purple; lip and column with orange and yellow, crowded in long racemes. Bolivia, 8,000–9,000 ft. B.M. 6145.—*E. Wállisii*, Reichb. f. Sts. 4–6 ft.: fls. yellow, some purple spots; lip orange and purple, upon white ground. New Granada, 4,000–7,000 ft. Has lateral as well as terminal racemes. Once offered by Saul.

Encyclium: *E. ádvena*, Reichb. f. Fls. yellow, veined brown; lip yellowish white, purple-streaked. Brazil.—*E. alàtum*, Batem. Fls. 2 in. across, purple and green; lip yellowish, streaked with purple, fragrant. Cent. Amer. B.M. 3898.—*E. bífidum*, Aublet. Fls. pale green, dotted with purple; lip rose, orange and white. W. Indies, Guiana. B.R. 22:1879.—*E. Friderici-Guilièlmi*, Warsc. & Reichb. f. Bulbs 4–5 ft.: fls. dark purple; base of lip white and yellow. Peru, 6,000–8,000 ft. I.H. 18:48. Once offered by Saul.—*E. gallopavìnum*, Reichb. f. Fls. brown; lip yellow, in large racemes. Brazil.—*E. oncidioìdes*, Lindl. Panicles up to 6 ft. long: fls. yellow and brown, sweet-scented. Stately species. Guiana. B.R. 19:1623. Once offered by Saul.—*E. phœníceum*, Lindl. Panicles 2–3 ft.: fls. deep purple, mottled green; lip rich violet, stained crimson. Handsome. Cuba.—*F. virgàtum*, Lindl. Scape up to 7 ft. high: fls. small, up to 20, greenish, stained brown. Mexico.

GEORGE HANSEN.

EPIGÈA (Greek, *epi*, upon, *gaia*, earth; in reference to its trailing growth). *Ericàceæ*. This genus includes our charming Trailing Arbutus, which in New England at least is the most popular of all our wild flowers. Creeping, branching, slightly woody, more or less rough hairy shrubs: lvs. alternate and entire, petiolate, leathery and evergreen: fls. monopetalous, perfect, large, dimorphous or diœcious, sessile in axillary or terminal clusters; sepals 5; corolla salver-shaped, with 5-parted spreading border; stamens 10, attached to the base of the corolla; style columnar; stigma 5-lobed: ovary ovoid, 5-celled, many-ovuled; capsule depressed-globose, encircled by the persistent calyx. Two species, N. E. America and Japan. The *E. cordifolia* quoted in Index Kewensis as South American is probably not of this genus. It seems to be known only from the old description of Swartz (1792).

The cultivation of the Trailing Arbutus, especially in localities where it has been exterminated by ruthless "Mayflower parties," always attracts interest. Only a brief epitome is here given. For fuller details, consult G.F. 5:202 and 8:15; also "The Nursery Book," which gives the experience of a specialist. Occurs in sandy and rocky woods, especially under evergreen trees in earliest spring. Thrives only in a humid soil and shady situations. Transplanted with difficulty. When a too great shock is received from difference of exposure, change of temperature, etc., it dies within 2 or 3 years, if established at all. Small plants must be procured, removed without harming the roots, and planted under the same conditions of soil and exposure with the greatest care. They may also be taken up in late September or October, new roots formed in the greenhouse or coldframe, wintered in a coldpit, but not planted until the second spring. Best on the north side of a hill, in light, sandy soil, mixed with leaf-mold. Once established it spreads rapidly. Prop. by division of old plants, layers or cuttings. Seeds are rarely found, but when found may be used, though slow to develop.

rèpens, Linn. TRAILING ARBUTUS. GROUND LAUREL. MAYFLOWER. (The Mayflower of English history and literature is the Hawthorn.) Fig. 763. Spreading on the ground in large patches, with hirsute branches 6–15 in. long just beneath the lvs., sending out roots and leaf- and flower-bearing stalks every 2–3 in.: lvs. oval or nearly orbicular, thick, acute or obtuse, cordate or rounded at the base, glabrous above, hirsute below, green on both sides, 1–3 in. long, petioles hairy: fls. spicy-fragrant, few or several crowded in clusters, practically diœcious, either stamens or pistils being abortive, the female fls. larger and whiter, the male smaller and rosy. Em. 431. G.W.F. 37. Mn. 3:17. Gn. 45, p. 193. Newfoundland to N. W. Terr., south to Fla., Ky. and Mich., chiefly east. The vernacular name is pronounced Ar'-bu-tus, not Ar-bu'-tus.

A. PHELPS WYMAN.

EPILÆLIA and **EPICATTLEYA** are bigeneric hybrids. See G.C. III. 16:629; 21:233; 22:83; 23:391.

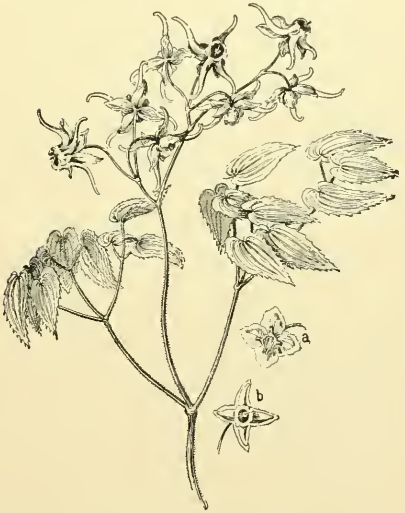
EPILÒBIUM (Greek, *upon the pod;* the flower and pod appearing together). *Onagràceæ.* This genus includes hardy herbaceous perennial plants, thriving in any soil, with willow-like foliage, and large, showy spikes of deep pink or rosy crimson fls. borne from June to August. They are particularly suited for naturalizing in meadows for mass effects. A genus of about 65 species, widely scattered in temperate and frigid regions: herbs, or subshrubs, erect, sprawling or creeping: lvs. alternate and opposite, toothed or not: fls. axillary or terminal, solitary or in spikes or racemes, rosy purple or flesh-colored, very rarely yellow; calyx tube scarcely, if at all, produced beyond the ovary; petals 4, obovate or obcordate, erect or spreading; stamens 8: ovary 4-celled; seeds comose.

The taller species, like *E. angustifolium* and *hirsutum*, make very rank growth in moist places, and are therefore especially adapted for the wild garden or for naturalizing along the water's edge and in low meadows. The underground runners travel great distances, and the plants spread fast when not kept in bounds. Prop. by division or seeds.

angustifòlium, Linn. (*E. spicàtum*, Lam.). GREAT WILLOW HERB. FIRE WEED. In cult. mostly branched and 3–5 ft. high; in the wild simple or branched, 2–8 ft. high: lvs. alternate, very short-petioled, lanceolate, entire or minutely toothed, 2–6 in. long, 4–12 lines wide, pale beneath, acute, narrowed at bases: fls. spreading, in long, terminal spike-like racemes, petals rounded at tip; stigma 4-lobed: capsules 2–3 in. long. Eu., Asia, N. Amer. B.B. 2:481. Var. **álba**, Hort., has pure white flowers suitable for cutting; also occurs wild. This variety was perfected in England. It forms a compact bush.

hirsùtum, Linn. Stout, 2–4 ft. high, with short but conspicuous soft hairs: lvs. oblong-lanceolate, usually opposite, sessile and often clasping, with many small, sharp teeth, 1–3 in. long, pubescent on both sides: fls. erect, axillary, about 1 in. across; petals notched. Ballast Weed from Europe. English names are Codlins and Cream, Fiddle Grass.

EPIMÈDIUM (Greek, *like Medion*, a plant said to grow in Media; a name from Dioscorides, retained by Linnæus). *Berberidàceæ.* This genus contains some of the daintiest and most interesting plants that can be grown in the hardy border, and *E. macranthum*, particularly, is as distinct, complicated and fascinating as many of the rare, tender and costly orchids. The whole tribe to which it belongs is exceptionally interesting, and is one of the most striking of those rare cases in which the cultural, botanical and artistic points of view have much in common. A well grown collection of these plants in pots would almost certainly win high praises and prizes. Of the 12 genera of this tribe, only Berberis and Nandina are shrubs, all the rest being herbs, with creeping, underground stems, and all small, choice, curious, and cultivated to a slight extent, except Bongardia and Leontice. Podophyllum contains our mandrake; Caulophyllum the quaint blue cohosh; and the others are Aceranthus, Achlys, Diphylleia, Jeffersonia and Vancouveria. A collection of all these plants should make a charming study. What appear to be petals in *E. macranthum* are really the inner row of sepals, colored like petals, and performing their functions, while the long spurs or nectaries are supposed to be highly specialized petals. Epimedium has 8 sepals and 4 petals, which are mostly small and in the form of nectaries: stamens 4: capsule opening by a valve on the back: lvs. pinnately twice or thrice dissected. They grow a foot or two high. For *E. diphyllum*, see *Aceranthus*, which is distinguished by its flat, not nectary-like petals, and its lvs. with a pair of leaflets on each of the 2 forks of the petiole. Of their culture J. B. Keller writes, "They thrive best in partial shade, and are particularly well suited for rockeries and the margins of shrubberies. Almost any soil will answer for them. The peculiar bronzy tints of the young foliage contrast well with the variously colored flowers. Prop. by division." These plants are suitable for pot-culture and for forcing. The Garden 48, p. 486, shows what a charming picture can be made of the foliage alone when cut and placed in a bowl. The plants retain their foliage all winter, especially in sheltered spots under trees.



764. Epimedium macranthum.

a, E. alpinum, var. rubrum; *b*, E. pinnatum, showing 3 types of spur or nectary.

A. *Spurs conspicuous, often 1 in. long, sometimes twice as long as the showy inner sepals.*

macránthum, Morr. & Decne. Fig. 764. Lvs. thrice ternate; leaflets cordate-ovate, unequal at the base, sharply toothed; petioles with short, spreading, conspicuous hairs: outer sepals sometimes colored bright red, remaining after the larger and showier parts of the fl. have fallen: inner sepals ovate-lanceolate, violet: spurs white. Japan. B.R. 22:1906. P.M. 5:151. Not Gn. 46:984, which is *E. pinnatum*. Var. **niveum**, Voss (*E. níveum*, Hort.), has pure white fls. Var. **ròseum**, Voss (*E. ròseum*, Hort. *E. níveum*, var. *ròseum*, Hort.), has fls. white, tinged with pink or pale rosy red. Var. **violàceum**, Voss (*E. violàceum*, Morr. & Decne.), has violet spurs, shorter than in *E. macranthum*, but much larger than in the other species. B.M. 3751. B.R. 26:43. P.M. 4:123.—A very interesting species.

AA. *Spurs medium-sized, nearly as long as the inner sepals.*

B. *Inner sepals bright red.*

alpìnum, var. **rùbrum**, Hook. (*E. rùbrum*, Morren). Fig. 764. Lvs. biternate (but Hooker's picture shows a tendency to the thrice ternate condition), minutely toothed: spurs white, marked with red, as in Fig. 764, which shows the very distinct appearance of the flower. Japan. B.M. 5671. R.B. 3, p. 33, t. 6 (1853). Hooker says this differs in no way from *E. alpinum*, except in the larger and red fls., while the type which grows wild in England (though probably not native) has dull reddish yellow fls., and, though advertised, is probably not in cultivation.

BB. *Inner sepals whitish or pale yellow.*

Musschiànum, Morr. & Decne. Lvs. only once ternate, sharply toothed, as in *E. macranthum*: all floral parts whitish or pale yellow. Japan. B.M. 3745.—The least showy kind, but worth growing in a collection, its spurs having an individuality difficult to describe. Var. **rùbrum**, of Pitcher & Manda's catalogue, is presumably an error, as a red-fld. form would be very unexpected.

AAA. *Spurs much shorter than the inner sepals, being, in fact, merely small nectar-glands.*

B. *Lvs. once or twice ternate.*

pinnàtum, Fisch. Fig. 764. Lvs. usually biternate, with 5 leaflets, 3 above and 1 on each side; leaflets with a deeper and narrower basal cut than in *E. macranthum*: fls. typically bright yellow; nectaries red, a third or fourth as long as the inner sepals. Shady mountain woods of Persia and Caucasus. B.M. 4456. Gn. 46:984, erroneously as *E. macranthum*. Gn. 48, p. 486.

Var. **élegans**, Hort., presumably has larger, brighter and more numerous fls. *E. sulphureum* of European catalogues is regarded by J. W. Manning and J. B. Keller as a pale yellow-fld. form of *E. pinnatum*, but by Voss as a variety of *E. macranthum*. A yellow form of the violet-fld. *E. macranthum* would be very surprising.

Var. **Cólchicum**, Hort. (*E. Cólchicum*, Hort.), has brilliant golden yellow fls. and nectaries 1–1½ lines long.

BB. *Lvs. always once ternate.*

Perralderiànum, Cosson. This is the African representative of *E. pinnatum*, from which it differs in the key characters and also in the much more strongly ciliate-toothed leaflets. Its flowers are a "paler yellow than the typical *E. pinnatum*. It is far from improbable that specimens connecting them will be found in southern Europe, if not in Africa." Algeria. B.M. 6509.—Lvs. remain all winter. Less desirable than *E. pinnatum*.

E. diphýllum, Lodd. See Aceranthus diphyllus.—*E. niveum* is catalogued by Van Tubergen as a synonym of Musschianum, but the chances are that all the plants advertised as E. niveum are E. macranthum, var. niveum. The spurs are so obviously longer in E. macranthum that there is no excuse for confusion.

W. M.

EPIPÁCTIS (Greek, *epipegnuo;* it coagulates milk). *Orchidàceæ*. Hardy terrestrial orchids of minor value. The first mentioned may be obtained through dealers in native western and Japanese plants; the second is listed in the American edition of a Dutch catalogue. Leafy orchids with creeping rootstocks and unbranched stems: lvs. ovate or lanceolate, with plaited veins: fls. purplish brown, nearly white or tinged red: lower bracts often longer than the fls.; sepals free, spreading, nearly as large as the petals; lip free, deeply concave at base, without callosities, narrowly constricted and somewhat jointed in the middle, the upper portion dilated, petaloid.

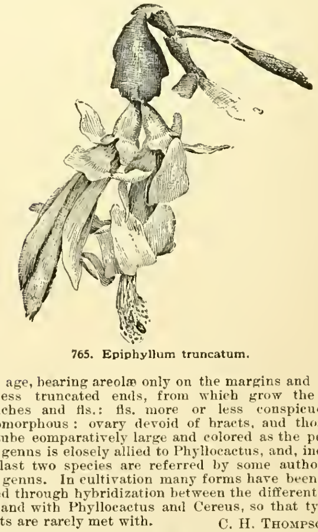
Royleàna, Lindl. (*E. gigantèa*, Dougl.). Stout, 1–4 ft. high: lvs. from ovate below to narrowly lanceolate above, 3–8 in. long: fls. 3–10, greenish, strongly veined with purple. June, July. Wash. to Santa Barbara, east to S. Utah and W. Tex., on banks of streams. Also Himalayas. Int. by Pringle and Horsford, 1883. Mn. 8:145.

atrórubens, Schult. (*E. rubiginòsa*, Crantz). Lvs. often reddish: fls. and ovary dark purple; lip oval, acute, or slightly notched: bracts equaling the fls. or rarely longer. July–Sep. Eu., W. Asia.

EPIPHRONÌTIS is a bigeneric orchid hybrid of Epidendrum and Sophronitis, for a charming picture of which see R.H. 1896:476. It has about 10 fls., chiefly a brilliant scarlet, set off with bright yellow. Gt. 46, p. 555.

EPIPHÝLLUM (*on a leaf;* referring to the leaf-like branches on which the fls. grow). *Cactàceæ*. CRAB CACTUS. This genus is confined to Brazil, so far as known, where the plants grow as epiphytes upon the trees, along with orchids, growing in large clusters on the branches: stems flat and jointed, becoming rounded with age, bearing areolæ only on the margins and more or less truncated ends, from which grow the new branches and fls.: fls. more or less conspicuously zygomorphous: ovary devoid of bracts, and those of the tube comparatively large and colored as the petals. The genus is closely allied to Phyllocactus, and, indeed, the last two species are referred by some authors to that genus. In cultivation many forms have been produced through hybridization between the different species and with Phyllocactus and Cereus, so that typical plants are rarely met with.

C. H. THOMPSON.


765. Epiphyllum truncatum.

Epiphyllums are among the most useful as decorative plants of all the Cactaceæ. Their brilliant colored blossoms, together with the profusion with which they are usually borne, makes them worthy of a place in every collection of plants. They are propagated by cuttings, which root readily when inserted in an ordinary propagating bed. Being low-growing or pendent-habited plants, they are very useful subjects for hanging baskets. Like most of the Cactus family, they may be grafted readily upon other Cacti. When grown as pot-plants, they are often grafted to elevate them above the pots, so as to show them off to better advantage when in flower. *Pereskia aculeata* and *P. Bleo* are the stock most commonly used for grafting Epiphyllums upon, though some gardeners prefer grafting upon *Cereus triangularis*, taking clean, healthy pieces about 1 foot in length, first rooting them and establishing them in pots, then grafting when active growth of the Epiphyllums commences in spring. It is said by some gardeners that Epiphyllums do better and may be brought into flower earlier by grafting on *Cereus triangularis*. Other species of Cereus may also be used as stock plants for grafting upon, especially the upright-growing species, as *C. colubrinus*. The system known as wedge-grafting is the best method.

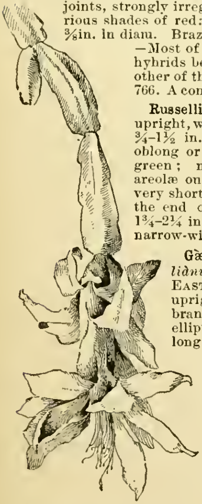
When grown upon their own roots, the soil best suited to them is two-thirds fibrous loam and one-third leaf-mold, with a fair proportion of silver sand and pounded brick added to keep the soil porous, as they are very impatient of too much moisture at the roots. The pots or pans in which they are grown must also be well drained. They require careful watering at all times, but during the fall and early winter they should receive only enough to keep them from shriveling. They are best kept in the greenhouse the whole year round, giving them an abundance of air during the summer to insure well ripened growth. A temperature of 45–50° during winter will be sufficient, though a higher temperature may be given after January 1 if wanted in flower earlier.

Edward J. Canning.

truncàtum, Haw. Crab Cactus. Christmas Cactus. Fig. 765. Stems much branched and hanging in large bunches from the trees: joints obovate to oblong, with strongly truncate apex, 1¼–2 in. long by about ¾–1 in. broad, bright green, margins coarsely serrate, with 1–3 large, acute teeth on each side, the 2 upper ones forming more or less incurved horns on either side of the truncation: areolæ bearing a few short, yellowish or dark colored bristles, or sometimes none: fls. horizontal, growing from the truncated end of the younger joints, strongly irregular, 2½–3½ in. long, in various shades of red: fr. pear-shaped, red, about ⅜in. in diam. Braz. B.M. 2562. G.C. III. 19:9. —Most of the forms in cultivation are hybrids between this species and some other of the genus or with Cereus. Fig. 766. A common basket and rafter plant.

Russelliànum, Hook. Stems more upright, with pendent branches: joints ¾–1½ in. long by ⅜–¾ in. broad, oblong or elliptical to obovate, light green; margins crenate, with 2–4 areolæ on either side, bearing a few very short dark gray bristles: fls. from the end of the youngest joints, red, 1¾–2¼ in. long: fr. red, 4-angled or narrow-winged. Braz. B.M. 3717.

Gæ̀rtneri, K. Sch. (*E. Russelliànum*, var. *Gæ̀rtneri*, Reg.). Easter Cactus. Stems of more upright habit, with drooping branches: joints long-oblong or elliptical to obovate, ⅝–2¼ in. long by ½–1 in. broad, dark green, margins crenate, with about 5 areolæ on either side, bearing 6–12 rather stiff, long, yellow or brown bristles, and are especially conspicuous on the truncated apex, where they form a considerable beard: fls. from the apex of the youngest joints, 2½–3 in. long, scarlet-red: fr. red. Braz. B.M. 7201.

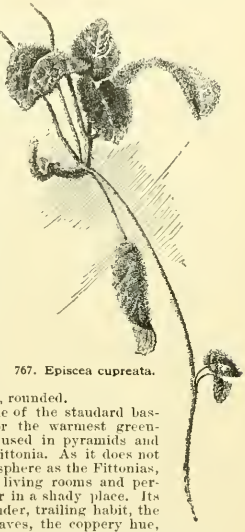

766. Epiphyllum truncatum × Russellianum.

Epiphyllum Guedneyri, Houllet=Phyllocactus sp.

C. H. Thompson.

EPIPHYTES, or air plants, grow on trees or other plants without robbing them of food. Orchids are the most famous examples among garden plants. Some orchids, however, grow in the soil, and others are true parasites. Plants that live on decaying organic matter, and have lost more or less of their leaf-green, are called saprophytes. Many mosses are Epiphytes.

EPÍSCIA (Greek, *shady*; they grow wild in shady places). *Gesneràceæ*. Probably the best garden form of this genus is the refined and elegant basket plant, *E. cupreata*, with its rich, coppery colored, softly hairy leaves, shown in Fig. 767. The genus has perhaps 30 species, all tropical American. Herbs with long, short or no hairs: stem from a creeping root, branched or not: lvs. opposite, equal or not in size: fls. pedicelled, axillary, solitary or clustered; corollas mostly scarlet, rarely whitish or purplish; tube straight or curved, more or less spurred at the base; limb oblique or nearly equal; lobes 5, spreading, rounded.


767. Episcea cupreata.

Episcia cupreata is one of the standard basket plants, especially for the warmest greenhouses. It can also be used in pyramids and mounds, as told under Fittonia. As it does not require so close an atmosphere as the Fittonias, it can be grown in some living rooms and perhaps outdoors in summer in a shady place. Its chief charms are the slender, trailing habit, the soft hairiness of the leaves, the coppery hue, which is often laid on like paint in two broad bands skirting the midrib, and the rarer and perhaps finer metallic bluish luster of which one occasionally gets a glimpse in a finely grown specimen. Give very rich, fibrous loam, and in summer partial shade.

A. *Fls. white.*

Chontalénsis, Hook. (*Cyrtodeìra Chontalénsis*, Seem.). Stems stout, more or less ascending, dark reddish purple, 6–10 in. long: lvs. opposite and irregularly whorled, 3–4 in. long, oblong-ovate, crenate, obtuse, rounded at the base, decidedly convex on both sides of the midrib and between the much-sunk veins, margins recurved, green, marked with regular purple patches, which advance from the margins between the veins toward the midrib and are more or less oblong: fls. in 1's and 2's; corolla tube with a sac at the base, the limb oblique, 1½–2 in. across, with small and regular but conspicuous and beautiful teeth. Chontales region of Nicaragua. B.M. 5925. R.B. 22:241. F.S. 18: 1924.

AA. *Fls. scarlet.*

cupreàta, Hanst. (*Achimènes cupreàta*, Hook.). Fig. 767. Stems slender, creeping, branched, rooting at the joints, with a main branch rising erect a few inches, which bears the fls. and the largest lvs.: lvs. copper-colored above: fls. solitary, 9 lines wide, scarlet, with a small sac and denticulate limb. Nicaragua. B.M. 4312. Var. **viridifòlia**, Hook., has green foliage and larger fls., 1 in. across. B.M. 5195.

coccínea, Benth. & Hook. (*Cyrlodeìra coccínea*, Hort., B. S. Williams). Lvs. dark metallic green, 3–4 in. long, 2½–3 in. wide. Free-flowering.

Robert Shore and W. M.

EQUISÈTUM contains the weed known as Horse-tails, or Scouring-rushes. They are suitable for naturalizing in waste and wettish places. They hold sandy banks. The following have been advertised by dealers in native plants: *E. arvénse, hiemàle* (Fig. 768), *limòsum, praténse, robústum, scirpoìdes, sylváticum, variegàtum.* For descriptions, consult the manuals. They grow usually in moist or swale-like places. They are flowerless plants, allied to ferns and club-mosses.

768. Equisetum hyemale—Common Scouring-rush.

ERAGRÓSTIS (Greek, *love* and *grass*). *Gramíneæ.* LOVE GRASS. Annual or perennial grasses, with herbaceous stems of various habits, and from 6 in. to several feet tall. Culms simple or often branched. Inflorescence composed of very variable panicles, either close and narrow, or loose and widely spreading: spikelets 2-many-fld., the uppermost imperfect. Closely allied to Poa, from which it can be distinguished by its 3-nerved fl.-glumes, which are destitute of any woolliness. The species are very variable and their limits hard to define. About 100 species occur in the warm and temperate regions of both hemispheres, few of which are of any agricultural or horticultural value. The following are cult. as "ornamental grasses" in flower gardens.

Abyssínica, Link. A branching, leafy annual, 2–4 ft. high, with widely spreading capillary panicles of many spikelets: lvs. 12–14 in. long, rough on the upper side, ligule a mere ring: panicles slender, gracefully drooping, grayish when in full bloom: spikelets 5–7-fld., one-fifth of an inch long. Africa. —In cult. as an ornamental grass for bouquets. Grain used as food in Africa. By some referred to Poa.

amábilis, Wight & Arn. (*Pòa amábilis,* Linn.). An erect grass 6 in. to 1 ft. high, with inconspicuous linear-lanceolate lvs., ciliate at the base: spikelets very large and broad, closely resembling quaking-grass (Briza), 16–24-fld. India.—In cult. as an ornamental grass.

élegans, Nees. FEATHER LOVE-GRASS. An erect grass 1–2 ft. high, with smooth culms and rough lvs.: panicles closely contracted, dense: spikelets very small, 4–7-fld., numerous, and presenting a feather-like appearance in mass. S. Amer.—In cult. as an ornamental grass.

máxima, Baker. LARGE LOVE-GRASS. A tall, robust plant, 2–3 ft. high, with lanceolate acuminate lvs., cordate at the base: panicles very lax and broad, 6–9 in. long: spikelets oblong, flattened, very large, ½–⅓ in. long. Madagascar.—One of the most ornamental species of the genus.

collìna, Trin. (*E. suavèolens,* Becker). Fig. 769. An erect, leafy annual, 1–3 ft. high, with densely fld., spreading panicles: spikelets 6–13-fld., numerous, one-fifth in. long: pedicels of spikelets and branches of panicle rough: lvs. smooth beneath, rough above. Asia.—The species is very variable under cult., many different forms being found. In cult. as an ornamental grass for bouquets.

E. màjor, Host. STINK GRASS. A common species, growing chiefly in cultivated or waste ground. When fresh it emits a strong, unpleasant odor.—Intr. from Eu.—*E. pectinàcea,* Nees. MEADOW COMB-GRASS. A very pretty perennial grass, with showy colored spikelets. A native of the eastern, southern and middle states. It is often gathered for dry bouquets. Should be int. into cult. for ornament.

The seed sent out by a leading seedsman as containing five different species (*E. elegans, amabilis, maxima, suaveolens,* and *Poa amabilis*), when grown proved to be one and the same thing; viz., *E. suaveolens.* This statement is made from specimens grown by Professor Tracy, of Starkville, Miss., in 1885, and also observed by myself in 1897, both in the Hort. and the Bot. Gardens at Cornell University. P. B. KENNEDY.

ERÁNTHEMUM (Greek, *lovely flower*). *Acanthàceæ.* Perhaps 30 species of tropical shrubs and subshrubs, some of which are cultivated chiefly for their foliage and others for their flowers. Lvs. entire or rarely coarsely toothed: fls. white, lilac, rosy or red, borne in various ways; bracts and bractlets narrow, small; corolla tube long, slender, cylindrical throughout or rarely with a short throat; limb 5-parted; stamens 2: ovules 2 in each cell; seeds 4 or fewer. The genus Dædalacanthus, although in a different tribe, is separated only by a combination of technical characters, but the garden forms of both genera described in this work are all distinguishable at a glance. For culture, see *Justicia.* Consult *Dædalacanthus.*

A. *Fls. purple.*

laxiflòrum, Gray. Height 2–4 ft.: lvs. on the same plant varying greatly in size and shape, those near the fls. 2–3½in. long, 8–15 lines wide; petioles 2–6 lines long, widest below at or above the middle, more or less ovate-oblong, obtuse, narrowed at the base: fls. in cymes; stamens 2, perfect, sharp-pointed. Fiji. B.M. 6336.

AA. *Fls. pure white.*

tuberculàtum, Hook. Easily told while growing by the many small roundish and rough elevations on the branches: lvs. small, ⅜–⅝ in. wide, rarely if ever 1 in. long, broadly ellipitical, obtuse or notched, almost sessile: fls. numerous, borne singly in the axils, in summer; corolla tube very long and slender, 1½ in. long; limb 1 in. across; stamens scarcely exerted. Habitat unknown. B.M. 5405.

AAA. *Fls. white, speckled with red-purple.*

B. *Foliage netted with yellow.*

reticulàtum, Hort. (*E. Schómburgkii,* Linden). Height 4 ft.: upper lvs. 2–7 in. long, ovate-lanceolate, characteristically netted with yellow; lower lvs. 6–10 in. long, not netted, but the veins prominent and yellow: fls. racemose; corolla speckled with blood-red at the mouth; anthers reddish brown, exserted. Possibly Australia. B.M. 7480. I.H. 26:349.

769. Eragrostis collina (× ¼).

BB. *Foliage not netted with yellow.*

Ándersoni, Mast. Lvs. lanceolate or elliptic, narrowed into a short stalk: fls. in a spike 6 in. long; lower middle lobe of the corolla larger and speckled with purple. Trinidad. Gn. 45:943.

The following trade names belong to plants grown chiefly for their foliage. Probably many of them belong in other genera. —*E. albo-marginàtum.* Lvs. broadly margined with white and irregularly suffused gray.—*E. atrosanguineum*, Hort. Int. by W. Bull, 1875. Lvs. large, dark wine-purple, or blackish crimson, ovate entire, opposite, stalked. Said to endure the hottest sunshine.—*E. cultràtum.* "Lvs. shining, thick, deep-veined."—*E. Eldoràdo.* Lvs. greenish yellow, veins deeper yellow.—*E. nerium rùbrum* of Pitcher & Manda's catalogue, presumably a misprint for *nervum-rubrum*, has lvs. "irregularly shaped, shaded with light and dark green, and blotched with yellow, which darkens to reddish purple." Possibly = Fittonia Verschaffeltii.—*E. nigréscens.* Presumably with blackish lvs.—*E. purpùreum.* "Lvs. and stems dark, lurid purple." Siebrecht & Wadley.

The following trade names are accounted for in other genera: *E. igneum.* See Chamæranthemum. — *E. nervosum* and *pulchellum.* See Dædalacanthus. W. M.

ERÁNTHIS (Greek, *er*, spring, and *anthos*, a flower; from the early opening of the flowers). *Ranunculàceæ.* WINTER ACONITE. Low perennial herbs, with tuberous rootstock: basal lvs. palmately dissected, one stem-leaf sessile or amplexicaul just beneath the large yellow fl.: sepals 5–8, petal-like; petals small, 2-lipped nectaries; stamens numerous; carpels few, stalked, many-ovuled, becoming follicles. About 7 species, natives of Europe and Asia. Very hardy, and at home in half-shady places, among shrubs or in the border; very desirable because of the very early, bright fls. Prop. by division of roots. The place where the tubers are planted should be marked during the summer, when the foliage is dead.

770. Eranthis hyemalis.

The earliest generic name is *Cammarum*, which was given in Hill's British Herbal, p. 47, pl. 7 (1756), or 51 years before Salisbury made the name *Eranthis*.

hyemàlis, Salisb. (*Helléborus hyemàlis*, Linn.). Fig. 770. Erect, 5–8 in.: basal lvs. long-petioled: involucre 12–15-parted, the bright yellow-fls. always sessile; anthers oblong. Jan.–March. Naturalized from Eu. B.M. 3. Mn. 8:43. G.C. II. 11:245.

Var. **Cilicica**, Huth. (*E. Cilícica*, Schott & Kotschy). Much like the above. Involucre of deeper and more numerous lobes: anthers ovate instead of oblong; sepals broader, being about ½ in. across; follicles always straight. Season a few weeks later.—The stems, when grown in gardens, said to be red-brown. Roots of this were first sent to England from its native home near Smyrna in 1892. Rare in Amer. G.C. III. 13:266. Gn. 45, p. 192 (note).

Sibírica, DC. Much dwarfer, seldom over 3–4 in. high: fls. bright yellow, a little smaller than those of *E. hyemalis*, 5-sepaled. Siberia.

J. B. KELLER and K. C. DAVIS.

EREMÙRUS (Greek name, probably referring to their tall and striking aspect in solitary and desert places). *Liliàceæ.* These hardy desert plants when in flower, with their great flower-stalks taller than a man, and crowned with a spike of fls. from 1–4 ft. long, are amongst the most striking spectacles in the choicer gardens of the North and East. Their roots are clusters of fleshy fibers: their lvs. all from the root, in dense rosettes, long and linear: fls. white, yellow or rosy; perianth bell-shaped or more widely spreading, withering and persisting or finally dropping away; segments distinct or very slightly united at the base; stamens 6: ovary 3-celled; seeds 1–4 in each cell, 3-angled.

W. M.

E. robustus and *E. Himalaicus* are probably the hardiest of all the tall, desert-inhabiting plants of the Lily family—a family including the Poker Plant, the Aloes, the Yuccas, and many others that are not so tall and striking in appearance or else too tender to grow outdoors in the North. Large specimens of *E. robustus* will annually produce a flower-stalk 8 ft. or more high, with racemes 4 ft. long, remaining in bloom for a month. After flowering the lvs. disappear entirely, but early in spring they reappear, and should then be covered with a box or barrel, to protect the forming flower-stalk from late frosts. A mound of ashes over the crown in winter is advisable, or a box with water-tight top filled with dry leaves. Both species like a rich soil, moist but well drained, and plenty of water in the flowering period, but none afterwards. Prop. by division, or slowly by seeds. Large plants are expensive, but they can sometimes be obtained large enough to flower within a year or so of purchase. It tries one's patience to wait for seedlings to reach flowering size. The flowers look like small stars. W. C. EGAN.

A. *Flowers rosy.*

B. *Lvs. linear-ligulate.*

robústus, Regel. Root-fibers thick and fleshy: lvs. glaucous, glabrous, linear-ligulate, 2 ft. long, 1½–2 in. wide, roughish on the margin, with minute recurved teeth: raceme 4–4½ in. wide: stamens about as long as the perianth. Turkestan. B.M. 6726. Gng. 6:52, 324. Gn. 46, p. 335. Mn. 8:123. J.H. III. 29:267.

BB. *Lvs. ovate-lanceolate.*

Élwesii, Micheli (*E. Elwesiànus*, Hort.). Lvs. light green, ovate-lanceolate, obtuse, flat, not at all rough at the margin, shorter than in *E. robustus*, nearly triangular, even more glaucous, and beginning to decay at the time of flowering: perianth segments with a band of deeper color down the middle. Habitat ? R.H. 1897:280. Gn. 54, p. 99. G.C. III. 24:137.—Int. by Leichtlin as *D. robustus*, var. *Elwesii*.

AA. *Flowers white.*

Himalàicus, Baker. Root-fibers thick and fleshy: lvs. 9–12, ligulate, firm, persistent, 1–1½ ft. long, 6–15 lines wide above the middle: raceme 3–3½ in. wide: stamens about as long as the perianth. Himal. B.M. 7076. Gn. 49, p. 131. G.C. II. 16:49.

AAA. *Fls. some shade of yellow.*

B. *Color light yellow.*

spectábilis, Bieb. Root-fibers thick and fleshy: lvs. 6–15, lorate, slightly glaucous, 12–18 in. long, 6–12 lines wide above the middle, noticeably narrowed at the base: raceme 1–1½ ft. long, 2 in. wide: stamens orange, finally twice as long as the perianth. Asia Minor, Persia. B.M. 4870.

BB. *Color pure yellow or orange.*

Búngei, Baker. Lvs. contemporary with the fls., linear, 1 ft. long, less than 3 lines wide: raceme 4–5 in. long, 2 in. wide: stamens finally twice as long as the perianth. Persia.—Var. **perféctus**, Hort., is sold.

BBB. *Color orange.*

aurantiacus, Baker. Closely allied to *E. Bungei*, but live plants have less acutely keeled lvs.: root-fibers tapering upwards, and orange fls. and stamens. Bokhara, Turkestan. B.M. 7113. W. M.

ERIÁNTHUS (Greek, *woolly flower*). *Gramíneæ.* WOOLLY BEARD GRASS. PLUME GRASS. Tall and stout reed-like perennials, with the spikes crowded in a panicle and clothed with long, silky hairs, especially in a tuft around the base of each spikelet. Spikelets in pairs, one sessile, the other pedicellate. Glumes 4, the fourth enclosing a hermaphrodite flower and awned. Species about 18, in the warmer regions of both hemispheres.

Erianthus Ravennæ is the best hardy substitute for the pampas grass, which is the most famous of all tall, plumy grasses. For general purposes and for aquatic groups and bedding it has no peers in the North except *Arundo Donax* and a few tall bamboos. These latter, however, are grown for their foliage effects, and while the plumes of Arundo are highly ornamental, they are only an incident in the North, where frost often cuts down the plants before they flower. The general appearance of Erianthus is striking and unique, and for the plume-like character of its flowers it has few if any rivals.

Ravénnæ, Beauv. (*Sáccharum Ravénnæ*, Muir.). Wool Grass. Plume Grass. Ravenna Grass. A tall, hardy grass, 4–7 ft. high, very ornamental, either planted alone or in company with other grasses: lvs. very long, linear, pointed, band-like, sometimes violet, with a strong white rib in the center. The foliage forms graceful clumps, from which rise long and handsome plumes, resembling the pampas grass (*Gynerium argenteum*). Southern Europe. R.H. 1890, p. 546. Gn. 54, p. 496.—Its cultivation is not difficult in ordinary garden soil. A sunny situation is preferable. May be propagated by division or by seed. It is exquisite for lawns, and flowers the first season if sown very early. The plumes are fine for winter use when dried.

P. B. Kennedy and W. M.

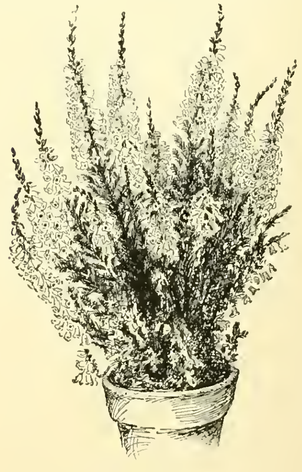
ERÌCA (practically meaningless; probably not from *ereiko*, to break, as commonly stated). *Ericàceæ*. Heath. This is the genus that the gardener usually means by "Heath." The Heath or heather of English literature and history belongs to the closely allied genus Calluna. The next most important group of cultivated "Heaths" is Epacris, which, however, belongs to a different order. Ericas are low-growing, evergreen, much branched shrubs, with needle-like lvs. in whorls of 3–6, and great numbers of small rosy, white, or rarely yellow fls., of which the most important types are the bell-shaped, the tubular, and the ventricose, the last being swelled at the base, and then tapering to a narrow neck just below the 4 spreading lobes. Erica is an enormous genus, and the hybrids are past reckoning.

Only a few of the European Heaths are hardy in America, and we have no native Heaths at all in this hemisphere. Of about 14 kinds of Erica grown outdoors in Europe to produce large showy masses, only 3 are hardy here, and it is safest to cover these with evergreen boughs in winter. Two others (*E. Mediterranea* and *E. Lusitanica*) we grow under glass somewhat. The tree Heath of southern Europe (*E. arborea*) will probably never be a feature of our southern landscapes.

The halcyon days of the Heaths were from about 1806 (when the English took the Cape of Good Hope) until the middle of the century. Andrews' colored engravings of Heaths (1809) marks the first flush of their popularity. Practically, if not absolutely, all the Heaths that are grown on a large scale have been developed from the South African species. The old English gardeners still lament the glorious days when the hard-wooded plants of Australia and the Cape formed the chief feature of European indoor horticulture. They complain that the present generation is not willing to give them the care they deserve. This is especially true of America. Nevertheless, according to William Watson, of Kew (in Garden and Forest, 1892, p. 136), Heaths are still grown in surprising quantities. Speaking of *E. hyemalis*, he says: "It may be said with truth that no other plant is grown in such enormous quantities for the London market. At least a dozen nurserymen might be named whose annual output of this one Heath amounts to from 20,000 to 30,000 plants each." He pictures a plant in a 5-inch pot, with about 15 shoots a foot high, and loaded with perhaps 1,000 flowers. Such plants sell at Christmas for about 36 cents. "The flowers remain fresh for at least a month. The popularity of this Heath is thus easily accounted for: it is cheap, very pretty when in flower, and lasts just long enough to satisfy the masses who like window-plants and change. The plants perish almost as soon as the flowers—that is, all those which find their way into the window of a house, or into a small greenhouse. And this accounts for the enormous number disposed of every year. In England *E. hyemalis* is certainly one of the most valuable plants ever introduced." (In America Heaths are of minor importance, even at Easter, and the kind grown most extensively for Christmas seems to be *E. melanthera*.) Watson adds: "It is strange that a plant which has enjoyed an exceptional popularity in England for something like fifty years should never have been figured in any English publication or work until now. I have not been able to trace the origin of the plant, nor find any picture of it in any book to which I have access here. Nor can any of those who have paid attention to garden Heaths assist me."

The great trouble with Heaths is the immense amount of care they need. Few, if any, classes of plants require more attention. Hence the growing of Heaths for the market is extremely specialized, and there is not a retail catalogue in the country that offers more than one species. Nevertheless, all the kinds described below are grown commercially, and are of the first importance in the genus. The stock is largely imported from England. Germany has a very different set of varieties, and France still another, and there are few cases among cultivated plants showing so great a difference in the three countries. The risks of importation are considerable, and the tendencies toward American independence in this line seem to be gaining.

Another difficulty in Heath culture is the poor quality of peat obtainable in America. In England the peat is more fibrous, and has been formed in past ages largely by the decay of the native heather.



771. Erica hyemalis.

From 300,000 to 400,000 plants of this Heath are sold in London every Christmas.

The soft-wooded kinds are the ones most grown. The hard-wooded sorts require a longer period of growth and more thorough ripening of the wood.

Apparently only one yellow-fld. Heath is cult. in America, *E. Cavendisheàna*. Unless otherwise stated, the species described below come from the Cape.

In general the Ericas do not grow well in this climate on account of the extreme heat of the summer months, but some varieties grow and flower even better here than in Europe. The choice of the soil is very important. A light peat, mixed with sharp, coarse sand is about the best we can get here. After flowering, the plants should always be cut down to keep them bushy at the base and well shaped. They will then receive a good repotting, using always very clean pots and plenty of drainage. Cuttings are made from December to April, preferably from young plants, the tender shoots, about 1 inch in length, being best. These are planted firmly in a pan filled with clean, fine sand, and covered with a bell-glass, or in a box covered tightly with a pane of glass. Bottom heat is not necessary. When rooted, the cuttings should be potted in small pots, and when well started should be given as much air as possible. It is well to bring the Ericas out of the greenhouse as early in the spring as possible. The pots should be plunged in a good situation, where plenty of air and sunlight can be had. They should be wintered in a greenhouse extremely well ventilated, and a temperature not higher than from 40° to 45° F. When in bud the plants should not be allowed to dry out too much. Once would be enough to cause the loss of all the buds. Very often the Heaths are attacked by a disease similar to mildew, caused by an excess of humidity in the air. As this disease is very contagious, it is well, as soon as noticed, to use sulphur in powder or sulphate of copper in solution until the plants are rid of it.

Index of species described below:

assurgens, 13.
Bothwelliana, 17.
Caffra, 13.
carnea, 1.
Cavendishiana, 11.
Cavendishii, 11.
codonodes, 14.
cupressina, 15.
cylindrica, 12.
fragrans, 9.
gracilis, 7.
herbacea, 1.
hiemalis, 5.
hyemalis, 5.
Lusitanica, 14.
Mediterranea, 16.
melanthera, 8.
Parmentierii, 6.
persoluta, 13.
præstans, 6.
regerminans, 3.
Tetralix, 4.
translucens, 18.
vagans, 2.
ventricosa, 17.
Vilmoreana, *Wilmoreana* and Wilmorei, 10.

A. *Hardy Heaths.*
B. *Spring-blooming* .... 1. **carnea**
BB. *Summer- and fall-blooming.*
C. *Inflorescence lateral* .... 2. **vagans**
CC. *Inflorescence terminal.*
D. *Ovary densely covered with long, rough hairs* .... 3. **stricta**
DD. *Ovary with short, soft hairs.* 4. **Tetralix**
AA. *Tender Heaths.*
B. *Fall-blooming.*
C. *Corolla club-shaped or funnel-shaped*................... .... 5. **hyemalis**
CC. *Corolla widest at base, tapering to a much constricted neck.* 6. **præstans**
CCC. *Corolla globose, the lobes very short* .... 7. **gracilis**
BB. *Christmas-blooming.*
C. *Corolla lobes long and spreading* .... 8. **melanthera**
CC. *Corolla lobes long and revolute* 9. **fragrans**
CCC. *Corolla lobes short and rather erect*.........................10. **Wilmorei**
BBB. *Easter-blooming.*
C. *Fls. yellow*...................11. **Cavendishiana**
CC. *Fls. rosy to white.*
D. *Corolla tubular*............12. **cylindrica**
DD. *Corolla globose.*
E. *Lvs. in threes.*
F. *Fls. white*..............13. **persoluta**
FF. *Fls. rosy.* ....14. **Lusitanica**
EE. *Lvs. in fours*.............15. **cupressina**
DDD. *Corolla urn-shaped, i. e., longer than* DD, *and more constricted at the neck*....16. **Mediterranea**
DDDD. *Corolla ventricose, i. e., swelled at the base, and tapering slowly to a narrow neck* ....17. **ventricosa**
18. **translucens**

1. **cárnea**, Linn. (*E. herbàcea*, Linn.). Height 6 in.: lvs. in 4's : inflorescence lateral : corolla broadly bell-shaped: anthers exserted: ovary glabrous. Mar.–May. Alps. L.B.C. 15:1452. B.M. 11. Gn. 54:1177 (a charming picture). The bright rosy-fld. form is the best and most striking. There are pale red and pure white varieties. The most popular of all hardy Ericas. Very easily prop. by division. We should try *E. Mediterranea*, var. *hybrida*, Hort., said to be a cross with *E. carnea*, and in England thriving almost as well in loam as in peat. See Gn. 55, p. 125, and 54, p. 262.

2. **vàgans**, Linn. CORNISH HEATH. Lvs. in 4's or 5's: sepals small, ovate, obtuse ; corolla ovate-bell-shaped; anthers ovate-oblong, 2-parted, exserted : ovary not hairy. W. Eu. and Medit. – Fls. pale purplish red. Grows 3–4 ft. in England; 1 ft. with J. W. Manning, Reading, Mass. Var. **álba** has white fls. Var. **capitàta**, grows 1–2 ft. high with Meehan at Germantown, Pa., and has "small whitish fls. with a purplish tip."

3. **stricta**, Don. CORSICAN HEATH. Lvs. in 4's, a little more erect than in Nos. 3 and 5 : sepals lanceolate, obtuse; corolla ovoid-oblong, narrowed at the throat; anthers awl-shaped or awned, included : ovary densely covered with long, rough hairs. Corsica.—Attains 4 ft. in England, but grows 1–2 ft. high with Meehan, at Germantown, Pa. Branches strict, rigid.

4. **Tetràlix**, Linn. BELL HEATHER. CROSS-LEAVED HEATH. Lvs. in 4's, margin folded back: fls. rosy; sepals ovate-lanceolate, ciliate ; anthers awl-shaped or awned, included : ovary with short, soft hairs. W. Eu. —Foliage grayish. Height in England 6–12 in. With Manning, at Reading, Mass., about 8 in.

5. **hyemàlis**, Hort. Fig. 771. Written also *hiemalis*. Watson thinks it may be a winter-flowering form of *E. perspicua*, figured in L.B.C. 2:102 and 18:1778 as *E. Linnæana*. Fls. rosy pink, tipped white. Var. **álba** has white fls. With L. Dupuy, Whitestone, L. I., it flowers in Sept. G.F. 5:137. Gn. 41:856. H. D. Darlington says it is very distinct from *E. perspicua*.

6. **præstans**, And. (*E. Parmentièrii*, Loddiges). Lvs. in 4's, somewhat incurved: bracts crowded : fls. nearly sessile, white, faintly flushed pink at base, in terminal groups of 4 or more; sepals ovate, rough-margined; anthers scarcely acute. Sep. Varieties are pictured under various names in L.B.C., plates 154, 1695, 197 and 1804.

7. **grácilis**, Salisb. Lvs. in 4's, somewhat erect: bracts remote : sepals smaller, lanceolated ; anthers with a short, sharp point. L.B.C. 3:244 (pale violet). "Fls. purplish red." Var. **autumnàlis**, Hort. Fls. Sep. Var. **vernàlis**, fls. in Oct. and Nov.

8. **melanthèra**, Linn. Fig. 772. Lvs. in 3's, obtuse, grooved on the back, younger ones often rough, with glands: bracts mostly crowded : fls. rosy; sepals obovate, keeled, colored ; anthers black: ovary villous. Not L.B.C. 9:867, which may be a form of *E. nigrita*. Flowers in Dec. and Jan. A.F. 11:1133 and 12:579. F.E. 9:333.

772. Erica melanthera.

9. **fràgrans**, And., not Salisb. Lvs. opposite, erect-appressed, acute, always glabrous: bracts loose, sepal-like: fls. in 2's ; sepals ovate, keeled, green : ovary glabrous or slightly bristly at the tip. Habitat? B.M. 2181. L.B.C. 3:288.

10. **Wilmorei**, Knowles & Westc. (*A. Wilmoreàna* and *Vilmoreàna*, Hort.). Hybrid : corolla tubular, bulged below the lobes, slightly velvety-hairy : fls. in 1's–3's, rosy, tipped white. R.H. 1892, p. 202. A.F. 4:251. G.C. III. 19:201.—Var. **glaúca**, Carr., has nearly glaucous foliage. Var. **calyculàta**, Carr., has a large additional calyx. R.H. 1892, p. 203. In England flowers in spring.

11. **Cavendishiàna**, Hort. (*E. Càvendishii*, Hort.). Hybrid of *E. depressa* × *E. Patersonii*. Lvs. in 4's, margins revolute: fls. in 2–4's; corolla tubular; stamens included; anthers awned. P.M. 13:3. G.C. 1845, p. 435. F.S. 2:142. A.F. 12:1143. Gng. 5:331. G.C. II. 18:213 and 20:597.

12. **cylíndrica**, And. and Hort., not Wendl. or Thunb. Important hybrid of unknown parentage, cult. since 1800. Lvs. in 4's: fls. nearly sessile; corolla 1 in. long, brilliant rosy red, with a faint circle of dull blue about two-thirds of the way from the base; anthers awned, included: ovary glabrous. L.B.C. 18:1734. R.H. 1859, p. 42.—Fls. very showy and unusually long. The oldest *E. cylindrica*. That of Wendland is a yellow-fld. species unknown to cult.

13. **persolùta**, Linn. Fig. 773. Essentially a white-fld. and very variable species, particularly as regards hairiness. Lvs. erect or spreading, hirsute or glabrous: corolla small, originally 1½ lines long; lobes ovate, 2–3 times shorter than the tube, the sinuses acute, narrow. S. Afr. The numerous varieties Bentham found impossible to separate either in the wild or in cultivation. Var. **hispídula**, Benth. Slightly hirsute: lvs. 2½–3 lines long, rough: anthers subovate. Var. **lævis**, Benth. Lvs. shorter, blunter, often appressed, glabrous; anthers subglobose. Var. **subcárnea**, Benth., has the corolla lobes more evident. To this last variety Bentham seems to refer most of the horticultural varieties cult. under the name of *E. persoluta*. *E. assúrgens*, Link., he refers to the first variety; *E. Cáffra* of Linnæus to the first, but of L.B.C. 2:196 (and the trade?) to the second. *E. regérminans* of Linnæus is a distinct species (figured in L.B.C. 17:1614 as *E. Smithiana*); of the trade = *E. persoluta*, var. *hispidula*; of L.B.C. 18:1728 = *E. persoluta*, var *subcarnea*. Flowers in February and March, while the other species, numbered from 12–18, mostly flower in March and April.

773. A form of Erica persoluta.

14. **Lusitánica**, Rudolph (*E. codonòdes*, Lindl.). SPANISH HEATH. Branches tomentose-pubescent: lvs. glabrous and ovary glabrous. W. Eu. B.R. 20:1698. G.C. II. 7:463; Ill. 19:487. I.H. 43, p. 321. Gn. 54: 1190; 55, p. 125.—Hardy in England, but not here.

15. **cupressìna**, Forbes (*E. turrígera*, Salisb.). Lvs. glabrous, subciliate or naked: inflorescence terminal: fls. pedicelled, in 1–4's: bracts remote: sepals finally reflexed; sinuses of the corolla acute, narrow. Probably a hybrid cult. since 1802. F.E. 9:333.

16. **Mediterrànea**, Linn. (*E. cárnea*, var. *occidentàlis*, Benth.). Fig. 774. This is considered by Bentham a western form of *E. carnea* (No. 1), with a little smaller fls., corolla a trifle wider at the apex, and anthers shortly exserted instead of included. *E. Mediterranea* of the trade is hardy in England, and perhaps second only to *E. carnea* in popularity there. In America it seems to be cult. only under glass. B.M. 471. Gn. 54: 1190; 55, p. 403.

774. Erica Mediterranea.

17. **ventricòsa**, Thunb. Lvs. in 4's, incurved to spreading, with pilose margins: inflorescence terminal: sepals keeled; anthers with 2 very short ears, or awned, included: ovary glabrous. B.M. 350. L.B.C. 5:431. Var. **grandiflòra**, with tubes over ½ in. long. L.B.C. 10:945. The following varieties are cult. by L. Dupuy: *Bothwelliana*, *breviflora*, *carnea rosea*, *cintra*, *hirsuta alba*, *magnifica*, *superba*, *tricolor*. See R.H. 1858, p. 450 and 1880:50. Gn. 45, p. 87. A.F. 10:1111. F.E. 9:333.

18. **translùcens**, Andr. Perhaps the first of all the garden hybrids between *E. tubiflora* and *E. ventricosa*. Lvs. rigid, with or without long, soft, red hairs: fls. in umbel-like heads; bracts remote; corolla rosy, 8–9 lines long; tube narrowly ventricose, pubescent: limb short, spreading: ovary sessile. Andr. Heaths, 295. Bentham considers this a synonym of *E. spuria*, Andr. Heaths, 60. Schultheis says "it is the finest Erica grown; a poor propagator but good grower. Takes 3 mos. to root."

The following are mostly kinds that have been grown successfully in small quantities by A. Schultheis but have never been advertised in American trade catalogues. H = hard-wooded; the rest are soft-wooded. S. Africa, unless stated.

E. ampullàcea, Curt. Lvs. ciliate, mucronate: bracts colored: fls. mostly in 4's; corolla ventricose, very sticky, typically white, lined with red, limb spreading, white. Var. rubra, Hort., is the only form cult. B.M. 303. L.B.C. 6:508. H.—*E. aristàta*, And. Readily distinguished by the long bristle which ends the lvs.: lvs. recurved: fls. in 4's; sepals keeled with red; corolla sticky, 1 in. long, ventricose, but with not so long and narrow a neck as in E. ampullacea. B.M. 1249. L.B.C. 1:73. H.—*E. barbâta*, And. Bristly and glandular-pubescent: lvs. in 4's: corolla urn-shaped, villous: ovary villous. L.B.C. 2:124.—*E. Bowieâna*, Lodd. Lvs. in 4–6's: inflorescence axillary: corolla tubular, slightly inflated: limb erect or scarcely open. L.B.C. 9:842.—*E. Burnètti*, Hort., not in Index Kewensis.—*E. conspícua*, Soland., is a species with club-shaped, villous fls. and villous lvs. in 4's. Var. splendens, Klotzsch, with the lvs. and sepals shining green and pubescent corollas, includes E. elata, And. L.B.C. 18:1788.—*E. Devoniàna* is not in Index Kewensis. H.—*E. elàta*, And. = E. conspicua, var. splendens.—*E. Irbyàna*, And. Allied to E. ampullacea, but with corolla narrower at the base and tapering with perfect regularity to just below the limb, where it has a prominent red bulge. It is also distinctly lined with red, and the sepals are green, though the bracts are colored, as in E. ampullacea. L.B.C. 9:816. H.—*E. nigrèscens*, once advertised by Pitcher & Manda, is presumably E. melanthera (H. D. Darlington).—*E. pàllida*. A confused name. The oldest plant of this name is Salisbury's, which has an urn-shaped corolla, fls. often in 3's, pubescent and hirsute branches and lvs. in 3's. L.B.C. 1:72 (as E. pura). *E. pàllida* of the trade is probably the tubular-fld. hybrid of Loddiges in L.B.C. 14:1355, which has axillary and terminal fls., and lvs. in 4's to 6's.—*E. perspícua*, Wendl., has a tubular or slightly club-shaped corolla, lvs. in 4's, pubescent or rough hairy, and fls. in 1–3's, but the plant in the trade is probably *E. perspicuoìdes*, Forbes, a hybrid, with longer and woollier hairs, fls. somewhat in umbels, nearly 1 in. long. Only var. erecta is grown here.—*E. Syndriàna* is grown by Louis Dupuy.—*E. tricolor* is perhaps the most confused name in the genus, and apparently one of the important kinds abroad, where it has many varieties and synonyms. In the trade it seems to stand for a handsome Heath, with lvs. in 4's, distinctly ciliate and terminated by a bristle: fls. in umbels of 8–10, 1 in. long, a little too inflated at the base for the typical tubular form, rosy at the base, then white, then green, and then suddenly constricted into a short neck; pedicels red and exceptionally long. This description is from L.B.C. 12:1105 (as E. eximia), one of the earliest pictures of these charming hybrids which Bentham refers to the hybrid E. aristella, Forbes.

Those who expect to import Ericas from the Old World will be grateful to A. Schulteis for the following list of kinds which he has been unable to grow successfully at College Point, L. I.: Soft-wooded kinds, *E. cerinthoides*, *colorans*, *intermedia*, *mammosa*, *mirabilis*; hard-wooded, *jasminoides*, *Marnockiana*.

LOUIS DUPUY and W. M.

ERIGÈNIA (Greek, *spring-born*). *Umbelliferæ*. HARBINGER OF SPRING. A monotypic genus. *E. bulbòsa*, Nutt., is low, nearly stemless, hardy, from a deep-lying tuber, with ternately decompound leaves and small umbels of minute white flowers. A few plants may have been sold by collectors and dealers in native plants. B.B. 2:542. The Greek pronunciation of the word was Erigeña, but usuage, euphony and analogy warrant the use of Erigènia.

L. H. B.

ERÍGERON (Greek, *old man in spring;* the young plants are somewhat hoary). *Compósitæ*. FLEABANE. The garden Fleabanes are hardy border plants, suggesting our native asters, but blooming much earlier, and growing in tufts like the English daisy, though usually from 9 in. to 2 ft. high. The genus has perhaps 100 species scattered over the world, particularly in temperate and mountainous regions. Stem-lvs. entire or toothed: fls. solitary, or in corymbs or panicles: rays in 2 or more series, mostly rose, violet or purple, rarely cream-colored or white, and one kind has splendid orange flowers.

The garden Fleabanes are practically all perennials. A few annuals are harmless and pretty weeds. Some species have roots that are biennial, but they increase by offsets, and make larger clumps from year to year. They are of easy culture. J. B. Keller finds that they do best when somewhat shaded from the midday sun. They are easily prop. by seeds or division, and doubtless by cuttings, if there were sufficient demand. Small, divided plants set out in early spring produce good-sized flowering plants the first year. A good show of bloom may be had from seeds sown outdoors as early as possible in spring. Some fine masses of these plants in the hardy border or wild garden are much more desirable than an isolated specimen or two of each kind. The most popular species is *E. speciosa*, of which double- and white-fld. forms should appear before long. At present it is the best kind, that has the rich, soft colors, from rose to violet and purple. *E. aurantiacus* has dazzling orange fls., and is unique in the genus.

A. *Fls. orange.*

aurantìacus, Regel. More or less velvety: height 9 in.: lvs. oval-oblong, clasping at the base, more or less twisted: heads one on a stem: involucral scales loose, reflexed. July, Aug. Turkestan. R.H. 1882:78. Gn. 52, p. 485.—Perhaps the showiest of the genus. Sold as "Double Orange Daisy."

AA. *Fls. creamy or white.*

B. *Lvs. linear.*

ochroleùcus, Nutt. Height 9–18 in.: stems mostly not branched: lvs. rather rigid: rays 40–60, white or purplish, never yellow. Gravelly hills and plains N. Wyo. and Mont. to Utah.—This and the next are rare kinds, sold by collectors and dealers in native plants, and not cult. abroad.

BB. *Lvs. broader, lanceolate to ovate, or obovate.*

Hówellii, Gray. Height about 1 ft.: root-lvs. obovate: stem-lvs. ovate, half-clasping: rays 30–35, 1–2 lines wide, white. Cascade Mts., Oregon.

mucronàtus, DC. Lvs. lanceolate, narrowed at base, ciliate, mostly entire, often with a long, callous mucro. Mex. J. B. Keller cultivates a lilac-fld. plant from the Himalayas as *E. mucronatus*, which he says is the same as *Vittadenia triloba*, which see.

AAA. *Fls. rosy, violet or purple.*

B. *Rays 100 or more, mostly narrow: lvs. entire.*

C. *Flower-heads large.*

D. *Involucre hairy.*

E. *Height about 2 ft.: stems several-fld.*

speciòsus, DC. (*Stenáctis speciòsa*, Lindl.). Height 1½–2 ft.: hairs few, loose: stem very leafy at top: root-lvs. more or less spatulate: stem-lvs. lanceolate, acute, half-clasping. B. C. to Ore. near the coast. B.M. 3606. B.R. 19:1577. Gn. 52:1149. Var. **supérbus**, Hort., sold abroad, has lighter colored and more numerous fls. Var. **màjor**, Hort., has broader rays and brighter colors.

EE. *Height 9–15 in.: stems usually 1-fld.*

glaùcus, Ker-Gawl. Lvs. slightly glaucous: root-lvs. rarely 2–3-toothed. Pacific coast, where it flowers most of the year. B.R. 1:10. Gn. 52, p. 484.

DD. *Involucre not hairy.*

macránthus, Nutt. Height 10–20 in.: hairs numerous and long or short, sometimes nearly absent: lvs. lanceolate to ovate. Rocky Mts. Wyo. to New Mex. and S. W. Utah. Gn. 52, p. 484.—A good species. Blooms later than the eastern species. Violet. Hardy.

CC. *Flower-heads (or disk) small.*

glabéllus, Nutt. Height 6–20 in.: root-lvs. spatulate: stem-lvs. lanceolate, gradually narrowing into bracts: involucre bristly, or at least pubescent: rays violet-purple or white. Minn. to Rockies. Gn. 52, p. 485. B.M. 2923. B.B. 3:385. L.B.C. 17:1631.—Cult. by D. M. Andrews, Boulder, Colo. Much cult. abroad.

BB. *Rays 70 or less, wider: lvs. entire or toothed.*

C. *Lvs. almost or quite entire.*

D. *Stems with several fls. in a corymb.*

Villársii, Bell. Root biennial: height 1 ft.: lvs. with 3 or 5 nerves, roughish: fls. corymbose. Eu. B.R. 7:583. L.B.C. 14:1390. Not cult., but in I.H. 43, p. 301, said to be a parent with *E. aurantiacus* of *E. hybridus roseus*, Hort., Haage & Schmidt. This is said to resemble *E. Villarsii* in habit, and *E. aurantiacus* in form of fls. but not in color. Said to bloom freely from May to autumn.

DD. *Stems mostly 1-fld.*

salsuginòsus, Gray. Height 12–20 in.: upper stem-lvs. with a characteristic mucro. The slightly viscid character of the involucre is particularly designative. Wet ground, on higher mountains, Alaska to Calif. and New Mex. B.M. 4942.

CC. *Lvs. coarsely toothed above the middle.*

bellidifòlius, Muhl. POOR ROBIN'S PLANTAIN. Makes new rosettes by offsets from underground stems: height 2 ft.: root-lvs. wider above the middle than in most species: stem-lvs. fewer: fls. spring. Damp borders of woods. Canada to Ill. and La. B.M. 2402. B.B. 3:388. D. 237.—"Fls. clear blue, on long stems."—*J. W. Manning*. Weedy.

E. purpùreum, Hort., according to H. A. Dreer, "rarely exceeds 10 in. in height, and has medium-sized fls. of soft, rosy purple, borne in graceful, spreading panicles." Form of *E. macranthus?* W. M.

ERÌNUS (a name derived from Dioscorides). *Scrophulariàceæ*. The most popular species of this small genus is a hardy, tufted plant 3 or 4 in. high, suited for steep sides of alpine gardens, where it produces in spring its racemes of small purple, rosy or white fls. Root-lvs. crowded, opposite: stem-lvs. alternate, oblong-spatulate, with a few coarse, rounded teeth: corolla lobes 5, obovate, the 2 upper ones slightly smaller: stamens 4, in two groups, included.

The secret of success in alpine gardens is said to be a constant supply of moisture with perfect drainage. As a class, alpines are impatient of standing water, and Erinus, which is a favorite, particularly so. J. B. Keller writes that Erinus should be planted in steep parts of the rockery where water cannot lodge on rainy days or in the winter and spring months. He adds that they need slight shade from midday sun. Divided plants are chiefly sold in America, but the amateur can soon produce a good carpet by the use of seeds. When well established, the seeds are self-sown and the offspring gain in hardiness. It may be safest to keep a pot or two in a coldframe over winter, until the plant can take care of itself. In England, seeds can be sown in earthy holes of brick walls, and Gn. 45, p. 134, shows a charming picture made by informal masses of flowering Erinus naturalized on some old stone steps.

alpìnus, Linn. Lvs. hairy: racemes 2½ in. long: fls. ½ in. across, purple. April–June. Mountains of W. Eu. B.M. 310.—Vars. **álbus** and **carmìneus**, Hort., have white and crimson fls. respectively.

The following trade names are accounted for in Zaluzianskia: *E. duplex*, *gracilis*, *Paxtoniana* and *speciosa*. W. M.

ERIOBÒTRYA (Greek, *woolly cluster*). *Rosàceæ*. Ten or twelve species, mostly East Asian, have been referred to this genus, but some authors restrict it to the one species described below, and others refer all the species to Photinia. Fls. large, white, fragrant, in a terminal rusty-woolly cluster; calyx thick, 5-toothed; petals 5, crenulate: ovary 3–5-loculed, each locule 1-ovuled.

Japónica, Lindl. (*Photínia Japónica*, Gray). LOQUAT. JAPAN PLUM and MEDLAR (erroneously). Small tree, 10–20 ft., with thick, evergreen, oval-oblong remotely-toothed lvs. near the summits of the branches the under surface rusty-tomentose: fr. a pear-shaped yellow pome (Fig. 775), with large seeds and an agreeable acid flavor. B.R. 5:365. A.G. 12:19.—The Loquat is native to China and Japan, but is much planted in the Gulf states and westward. It blooms from Aug. until the approach of winter, and ripens its clustered fr. in very early spring. The fruit is often seen in northern markets. It is a profuse bearer in congenial climates.

775. Loquat (×¾).

Loquat is an excellent decorative plant, either as an evergreen lawn tree south of Charleston, or as a potplant in the North. Grown from seeds, it is a most satisfactory conservatory subject, resisting uncongenial conditions.

L. H. B.

ERIOCNÈMA. Consult *Bertolonia.*

ERIODÈNDRON (Greek, *woolly tree;* alluding to the woolly fiber inside the fruit, called "ceibo" and "pochote" by the Mexicans, and used by them for stuffing pillows). *Malvàceæ.* Ten species of tropical trees, thorny or not: lvs. digitate; leaflets 3–7, entire: fls. solitary or clustered, large or medium-sized, rosy or whitish; petals oblong, pubescent or woolly; column of stamens with 5 branches at the top, each bearing 2–3 anthers. **E. occidentàle,** G. Don, is cult. by Franceschi, Santa Barbara, Calif., as *Ceiba occidentalis.*

ERIÓGONUM (Greek, *woolly joints*). *Polygonàceæ.* About 100 species, chiefly northwest American herbs, tufted subshrubs, or slender annuals, mostly densely woolly: lvs. crowded at the base of the stem, alternate, entire. *E. compósitum,* Dougl., perhaps the best known, has countless minute 6-lobed neutral colored fls., dull white to rosy, borne in compound umbels 5–6 in. deep and broad. The following have been advertised, but are practically unknown in our gardens: *E. campanulàtum, compósitum, flàvum, heracleoìdes, incànum, microthècum* var. *effùsum, níveum, nùdum, ovalifòlium, sphærocéphalum, thymoìdes, umbellàtum.* These kinds have been advertised by D. M. Andrews, Boulder, Colo., E. Gillett, Southwich, Mass., and F. H. Horsford, Charlotte, Vt. Consult American manuals and floras, and Proc. Am. Acad., vols. 8, 12 and 14. Should these attain any garden importance they may be reviewed in an annual continuation of this work. Species are usually found on calcareous soils.

W. M.

ERIÓPHORUM (*wool-bearing,* from the Greek; alluding to the heads of fruit). *Cyperàceæ.* Perennial rush-like plants, growing in swales: fls. in dense heads, the bristles very numerous and often becoming greatly elongated in fruit. None of them is known in cult., but the following have been offered by collectors: *E. alpínum,* Linn.; *E. cyperìnum,* Linn.; *E. lineàtum,* Benth. & Hook.; *E. polystàchyon,* Linn.; *E. vaginàtum,* Linn.; *E. Virgínicum,* Linn. All these are wild in the northern states. Useful for bog gardens. Avoid late fall planting.

ERIOPHÝLLUM (Greek, *woolly-leaved*). *Compósitæ* Perhaps a dozen species, all from western N. Amer. One kind cult. in a few hardy borders is a low, tufted, herbaceous perennial, with much divided lvs., covered with wool beneath (each stem bearing about 5), and 8-rayed, yellow heads, 2 in. across, borne in a loosely forking fashion on peduncles 3–7 in. long. The genus was included in Bahia by Bentham and Hooker, but is now kept distinct largely because of the permanently erect involucral bracts: seeds mostly 4-angled, and pappus of nerveless and mostly pointless, colorless portions.

cæspitòsum, Dougl. (*Actinélla lanàta,* Pursh, not Nutt. *Bahia lanàta* DC.), described above, has been advertised by E. Gillett. B.R. 14:1167 is badly drawn as to involucre and pappus.

ERIÓPSIS (Greek, *like Eria,* an orchid of the Epidendrum tribe, which it resembles when not in flower). *Orchidàceæ.* Five Peruvian orchids of the Vanda tribe allied to Acacallis and Warrea. Lvs. plicate; racemes 2 or 3, basal: fls. open, small, maxillaria-like, together: lip 3-lobed, the lateral lobes broad and erect. Cool house orchids, requiring the treatment of Cattleya.

biloba, Lindl. Pseudobulbs 3 inches long: lvs. lanceolate: fls. 1 in. across; sepals and petals yellow, with orange-red margins; labellum yellow spotted with brown. Colombia. B.R. 33:18.

rutidobùlbon, Hook. Stouter in habit than the above: pseudobulbs wrinkled, dark colored: racemes drooping: sepals and petals orange-yellow, with deeper colored margins; labellum white, with purple spots. Antioquia, in exposed positions on the stems of palms. Peru. B.M. 4437.

Hélenæ, Kränzlin. Said to be "the finest in this small and rare genus. It differs greatly in habit from the other members; the bulbs somewhat resemble those of *Epidendrum Brassavolæ,* but are much stronger, and bear three long, coriaceous, dark, glossy, green leaves. The flowers are twice as large as those of *E. biloba,* and are borne on tall, arching scapes. The sepals and petals are orange-colored, margined with purple, the lip similar, but with a yellow blotch, spotted with purple at the base."—*Sander & Co.,* 1899.

OAKES AMES.

ERIOSTÈMON (Greek, *woolly stamens*). *Rutàceæ.* Coolhouse evergreen shrubs from Australia, with starry, 5-petaled fls. an inch wide, of white or blush pink. Practically unknown in America, but abroad considered amongst the finest of hard-wooded winter or spring-blooming Australian plants. The nurserymen mostly graft them on stocks of Correa, an allied genus, which has tubular fls. instead of free petals. Lvs. alternate, entire, glandular-dotted: stamens 8–10, free, shorter than the petals; anthers pointed. Much care is needed to produce well-trained specimens. With the growth of wealth in America, more of the Australian hard-wooded plants will be grown by skilled gardeners in our finer establishments. The following kinds can be imported from Europe.

A. *Foliage linear or narrowly lanceolate.*

B. *Lvs. linear.*

scàber, Paxt. Lvs. covered with minute roughnesses: petals white, tipped pink. P.M. 13:127.

BB. *Lvs. narrowly lanceolate.*

linifòlius, Seghers. Lvs. broadest at middle, tapering both ways. R.B. 20:97.—Probably an old garden form of some well-known species.

AA. *Foliage conspicuously wider.*

B. *Lvs. 10–12 times as long as broad.*

C. *Apex abruptly pointed.*

myoporoìdes, DC. Lvs. widest at the middle, tapering evenly both ways: petals white, glandular on the back. B.M. 3180.

CC. *Apex blunt.*

salicifòlius, Sm. This willow-leaved species has perhaps the handsomest foliage. Lvs. widest above the middle, tapering more gradually to the base than to the apex: petals bright, soft pink. B.M. 2854.

BB. *Lvs. 3–4 times as long as broad.*

intermèdius, Hook. Lvs. 9–18 lines long, elliptical, abruptly pointed: petals lanceolate, white, but tipped with pink outside in the bud like the rest: ovary placed on a flat disk and not ringed at the base. Probably of garden origin. Intermediate between *E. myoporoides* and *buxifolius*. B.M. 4439.

buxifòlius, Sm. Lvs. as in *E. intermedius*, though perhaps smaller: petals obovate, white, tipped pink: ovary sunk into a double disk of 2 rings. B.M. 4101.—*E. densiflòrum*, Seghers., R.B. 20:97, looks like a prolific horticultural variety of this species. W. M.

ERITRÍCHIUM. For *E. barbigerum*, see *Krynitzkia*. For *E. nothofulvum*, see *Plagiobothrys*.

ERÒDIUM (Greek, *a heron;* alluding to the beaked fruit). *Geraniàceæ*. HERON'S BILL or STORK'S BILL. This genus contains a few low-growing, hardy herbaceous perennial plants, with finely cut foliage and fls. suggesting our wild and hardy Geraniums, from which they differ in having only 5 instead of 10 anther-bearing stamens, the other 5 being reduced to scales; also the tails of the carpels hairy inside. The common Geraniums of our home windows and summer flower-beds are the blended product of *Pelargonium zonale* and *P. inquinans*, and originally had the 2 upper petals distinctly smaller than the 3 lower ones, as do the other wild Pelargoniums from the Cape of Good Hope, while Erodium and the true genus, Geranium, of which a few sorts are cultivated in our hardy borders, have all 5 petals nearly equal in size. They also have small glands alternating with the petals, which are absent from Pelargonium. Erodium has about 50 widely scattered species. Herbs, rarely somewhat woody or tufted: lvs. opposite or alternate, one often smaller than its mate, stipuled, toothed, lobed or dissected: fls. mostly in umbels, of various shades, from crimson-pink to purple, with darker blotches on the 2 upper petals and the venation outlined in darker shades.

These plants are chiefly for the front row of the hardy borders and the rock-garden, where they thrive in a gritty loam. They like dry, sunny spots, and may be trusted with a conspicuous position, being chiefly valued for their steady succession of bloom from June to August. Divided plants are chiefly sold here, but the species are easily prop. by seeds. Of *E. moschatum* only seeds are sold, and these are sown annually, the species not being hardy. Nos. 1 and 4 are not native to America, being essentially Asian, but they grow wild in California and to some extent in eastern states. Some Erodiums can be grown in chinks of walls, but not *E. Manescavi*, which is the strongest-growing, showiest and best kind.

1. **cicutàrium**, L'Hérit. Tufted, lower and more slender than No. 4, less glandular, often with coarse, soft, short hairs: lvs. oblong, 1–2-pinnate; lfts. small, nearly sessile, the uppermost confluent, more sharply and deeply cut and with narrower lobes: stipules small, acute: sepals with 1 or 2 terminal bristles: filaments not toothed. Mediterranean regions, Asia. Mn. 7, p. 127.

2. **macradènium**, L'Hérit. Remarkable for the great length of the roots when twisting among rocks, and strong odor of the foliage. Lvs. hairy, glandular, 1½–2 in. long, oblong, pinnate; segments pinnatifid, rachis with a toothed wing: fls. light purple, the 2 upper petals a shade darker, and the spots nearly black. Pyrenees. B.M. 5665.

3. **Manescàvi**, Coss. Height 10–18 in.: lvs. attaining 6 in. long, 2½ in. wide; segments alternate, ovate, short-stalked, dentate, with sometimes a deeper cut: fls. at best 2 in. across, strong rosy purple, the spots of the upper petals only a shade or two darker. Pyrenees. Gn. 55:1220.—Colors stronger and more uniform than No. 2.

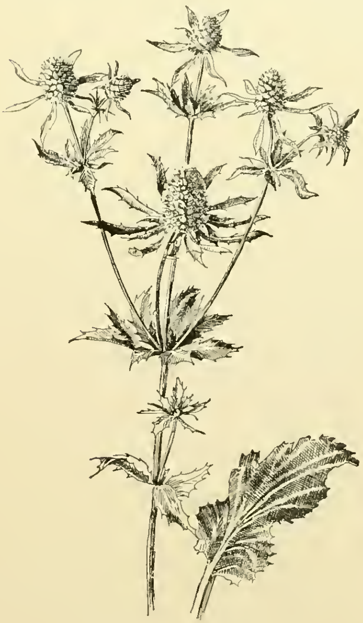
4. **moschàtum**, L'Hérit. Mostly stout and glandular: lfts. large, short-stalked, ovate to elliptical, serrate, broad-lobed: stipules large, rather obtuse: sepals not terminated by bristles: filaments 2-toothed. Mediterranean, Orient. W. M.

ERPÈTION. All referred to *Viola*.

ERÙCA (etymology in dispute; probably from the Latin *to burn*, in allusion to the hot seeds). *Cruciferæ*. Perhaps half a dozen herbs of Eu. and W. Asia, annual or biennial. Allied to Brassica: differs in the shorter, more turgid silique, with keeled valves; style elongated; seeds in two rows. **E. satìva**, Mill., Roquette or Tira, is the only species cult. in this country. It is a weedy, hispid annual, resembling a Mustard, 2–3 ft. high, with lyrate-pinnatifid lvs. and creamy yellow fls. See *Roquette*. L. H. B.

ERÝNGIUM (a name used by Theophrastus for some sort of thistle). *Umbellíferæ*. SEA HOLLY. The Sea Hollies are among the most bizarre of garden plants, and are chiefly valued for the steel-blue or purplish cast of their rigid stems, prickly foliage and teasel-like heads. They look like thistles, and do not suggest any relation to the umbelliferous family of which the flat-topped, white-flowered umbels of wild carrot are a common example. The genus has perhaps 100 species, mostly spiny herbs. The petals are white. All those described below are perennial.

The Sea Hollies are too queer and striking to be used as elements in the most restful and natural home-pictures, and their proper place is the hardy border, the natural repository for all sorts of curious things. Here they perpetually challenge one's curiosity and interest. There are two very distinct groups of them, one with much-cut foliage, as shown in Fig. 776, the other the "Pandanus group," with long, undivided leaves. A very different list of species is cult. abroad, but the main types are here now, and a collection of kinds is not as artistic as well massed groups of a single kind. They are slightly used in subtropical bedding. The dried stems retain their color, and are sometimes hung



776. Eryngium amethystinum.

up in living-rooms. The plants mostly grow from 2–3 ft. high and head out in July and Sep. J. B. Keller advises a light soil and sunny situation. *E. amethystinum* is probably the favorite. Meehan says that *E. planum* is much visited by bees. The weak point of Eryngiums is that they are slow to recover from the shock of division. This makes it difficult to work up a stock at home sufficient to make an effective group. D. Dewar, in his garden monograph of the group, Gn. 46, p. 522, says that the only safe way to increase the Sea Hollies is by seed. "Sow the seed in pans as soon as gathered, and place in a coldframe. The seeds will germinate in the spring, and if properly managed will be ready to plant out the following year." It is said that many of the species are less showy and satisfactory here than in England.

A. *Lvs. divided into radiating segments.*

B. *Bracts longer than the heads.*

C. *Number of bracts 10–20.*

D. *Root-lvs. deeply notched at the base and merely toothed at the margin.*

1. **alpìnum**, Linn. Bracts 10–20, a little longer than the oblong heads. Alps. R.H. 1876, p. 113. B.M. 922. Gn. 46:993.—There is a white variety.

DD. *Root-lvs. less deeply notched at the base, elsewhere more dissected.*

2. **Oliveriànum**, Laroch. Bracts 10–12, more rigid and fewer-toothed than in *E. alpinum:* heads ovate. Orient. Gn. 45, p. 223.

CC. *Number of bracts 6–9.*

D. *Root-lvs. deeply cut.*

3. **amethýstinum**, Linn. Fig. 776. Root-lvs. pinnatifid: bracts 7–8, few-toothed at the base, much longer than the globose heads. Eu. Gn. 46, p. 522, and 55, p. 454. *E. cœlestinum*, a trade name unknown to our botanies, is the same thing, according to J. B. Keller.

DD. *Root-lvs. merely crenate-dentate.*

4. **gigantèum**, Bieb. Root-lvs. deeply cordate: bracts 8–9: head ovate. Armenia. Gn. 46, p. 523.

BB. *Bracts as long as or shorter than the heads.*

C. *Upper stem-lvs. 5-parted.*

5. **plànum**, Linn. Middle stem-lvs. stalkless, undivided: bracts 6–7: head rotund. Eu., N. Asia.

CC. *Upper stem-lvs. about 8-parted.*

6. **Léavenworthii**, Torr. & Gray. Height 1–3 ft.: stem-lvs. stalkless, somewhat clasping: heads ovoid-oblong. Kans. to Tex., Mex. B.B. 2:522.

AA. *Lvs. undivided, long and linear.*

7. **aquáticum**, Linn. (*E. yuccæfòlium*, Michx.). Height 2–6 ft.: stem striate, unbranched or branched above: lvs. mostly clasping, finely parallel-veined, lower sometimes 3 ft. long, 1½ in. wide, all bristly margined: heads globose-ovoid. U. S. B.R. 5:372.

W. M.

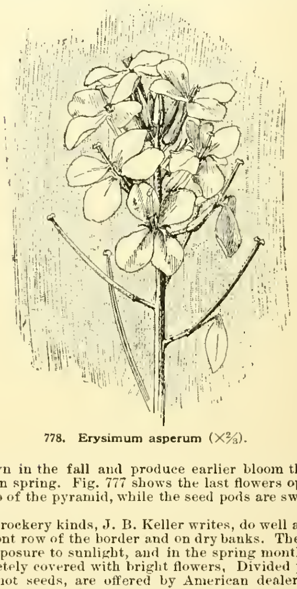
777. Erysimum asperum.

In No. 1 the involucre is a deeper blue than in Nos. 2–5; in No. 7 the involucre is not colored and the fls. are white or pale. No. 1 needs deep soil and partial shade. No. 3 also makes a good bog plant. No. 7 grows well in either wet or dry situations. Heights of the first five species, 2–3 ft.; 3–5, 2–3½; 3–4, 3–4.

F. W. Barclay.

ERÝSIMUM (possibly means blister-drawing). *Cruciferæ.* Of this big genus we cultivate two brilliant yellow and orange, spring- and summer-blooming, hardy "annuals," scarcely, if at all, inferior to the true wallflowers (Cheiranthus) for general purposes, and two lower-growing and perhaps earlier-blooming rock-garden plants. The genus has 70–100 species of biennial and perennial herbs, with long, soft, appressed, 2-parted hairs: lvs. narrow, linear or oblong, entire or variously toothed: fls. orange or yellow, rarely purple, often fragrant; petals 4: style persistent.

Although the two most popular kinds are biennials, the gardeners think of them as annuals. Their seeds can be sown in the fall and produce earlier bloom than if sown in spring. Fig. 777 shows the last flowers open at the top of the pyramid, while the seed pods are swelling below.



778. Erysimum asperum (×⅔).

The rockery kinds, J. B. Keller writes, do well also in the front row of the border and on dry banks. They like full exposure to sunlight, and in the spring months are completely covered with bright flowers. Divided plants only, not seeds, are offered by American dealers. In Gn. 24, p. 462, it is said that *E. ochroleucum* on level ground is likely to lose its lower lvs. and to perish on heavy soils in hard winters. It thrives best when frequently divided, and may be prop. by cuttings.

A. *Plants biennial: height 12–18 in.*

B. *Fls. yellow.*

ásperum, DC. (*E. Arkansànum*, Nutt.). Figs. 777, 778. Height 1–3 ft. in the wild, 12–18 in. in gardens: lvs. dentate or entire, upper ones mostly entire: fls. ½ in. across: pods rough, 1½–4 in. long, 4-sided, nearly erect. U. S. *E. Arkansanum* is merely a western and broader-leaved form. B.B. 2:152.

BB. *Fls. orange.*

Perofskiànum, Fisch. & Mey. Pods shorter than in the above, and standing out more nearly at right angles, not so stiff and straight, constricted below the narrower style. Caucasus, Afghanistan. B.M. 3757. P.M. 6:245.—There are strains of seed saved by Vilmorin-Andrieux & Co., from compact and dwarf plants suitable for edgings. (*E. Perofskianum nanum*, R.B. 32:101. *E. nanum compactum aureum*, Gt. 46, p. 194. *E. compactum aureum*, Peter Henderson & Co.).

AA. *Plants perennial: height mostly 4–6 in.: rock-garden plants.*

rupéstre, DC. (*E. pulchéllum*, J. Gay). Stem rather woody at base: lvs. somewhat dentate; stem-lvs. oblong, the hairs short, dense, 2–3-parted. Asia Minor. R.H.

1880, p. 412.—Woolson, Passaic, N. J., keeps the names separate. His plants of *E. rupestre* have "citron-yellow fls." *E. ruprestre* is "more spreading."

ochroleùcum, DC. (*E. Rhœ́ticum*, DC.). Height 4–12 in.: stems yellowish, creeping: lvs. entire or the upper with a few short, sharp teeth. Spain. J. W. Manning's plants of *E. Rhœticum* he considers same as *E. pulchellum*. They "grow 6 in. high, and have bright yellow fls. in May." Woolson's plants of *E. ochroleucum*, "from the Alps of Jura," have pale yellow fls.

W. M.

ERYTHÈA (one of the Hesperides, Daughter of Evening). *Palmàceæ*, tribe *Corỳpheæ*. Spineless palms with solitary robust caudices, ringed at the base, clothed above with dead leaf-sheaths. Leaves terminal, the younger ones tomentose, orbicular, flabellately many-parted, the lobes lacerated at the apex, intermingled with fibers, infolded; rachis short; ligule long; petiole stout, smooth or spiny along the margins; spadices long, white tomentose: branches stout; spathes many, sheathing the peduncle, thick-coriaceous, densely tomentose; bracts and bractlets distinct; fls. pale: fruit globose, small. Species 2. Southern California.

This small group of American palms includes two species only, as far as known at present, these being *E. armata*, which is known locally as the "Blue Palm," and *E. edulis*, the latter commonly known as the "Guadalupe Palm," from the fact that it has only been found in a wild state on the island of Guadalupe, off the coast of southern California. The plants in question belong to the fan-leaved section of palms, and bear much resemblance to Brahea, the segments of the leaves being adorned with whitish filaments. In the gardens of Santa Barbara, California, the Erytheas are planted out, and in a few years form very handsome trees, but in less favored latitudes they may be cultivated in the same manner as Kentias or Latanias, flourishing in a night temperature of 60° when grown in a rich and open soil and abundantly supplied with water.

armàta, Wats. (*Brahèa armàta*, Wats.). Blue Palm. Tall and slender, 40 ft. high: lvs. very glaucous; petiole narrow, deeply channeled, margined with numerous stout, more or less hooked, slightly spreading spines; segments 30–40, sub-lacerate at the apex, slightly filiferous. Lower California. G.C. III. 20:425.

édulis, S.Wats. (*Brahèa édulis*, Wendl.). Stem 30 ft. high, 15 in. thick, with thick, corky bark; sheaths fibrous, at length glabrous; petioles stout, 1 in. wide, plano-convex, unarmed on the acute margins, fibrous-pubescent or glabrate above; ligule 2–3 in. long, densely silky-tomentose; blade 3 ft.; segments 70–80, at first tomentose, lacerate at the apex and fibrous on the edges. California. R.H. 1893, p. 297, and 1897, p. 77. G.C. III. 13:507; 22:157.

Jared G. Smith and W. H. Taplin.

ERYTHRÆ̀A (Greek, *red;* alluding to the fls. of some species). *Gentianàceæ.* This includes two hardy plants with bright, deep rose fls., one of which is a rockery plant from the Azores, the other a Californian annual which deserves general cultivation. The flowers have slender green tubes an inch long, and a spreading limb of 5 oblong lobes, each half an inch long. The style of *E. venusta* is curious. Though longer than the stamens, it does not stand above them, but bends down and stands off at one side. The genus has possibly 30 widely scattered species, and no near allies of garden value. These plants bloom in summer and autumn.

Of *E. diffusa*, J. B. Keller writes: "A light, sandy loam, in a protected nook of the rockery, with partial shade, is required for this charming little alpine plant. It must be planted in a well sheltered position, and requires protection from sun and severe frost in winter, but the little plant is well worth all the extra care we may have to expend on it in winter. Prop. by cuttings, seeds or division."

Mássoni, Sweet (*E. diffùsa*, Woods). Height 4 in.: stems ascending, tufted, not branched above, 1–3-fld.: fls. lateral. Azores. Annuals in Azores, biennial in western Europe.—The plant cult. under this name is considered perennial by our nurserymen.

venùsta, Gray. Height 6–10 in.: stems erect, 4-angled, cymosely branched, as many as 14-fld.: lvs. ½–1 in. long, oblong or ovate oblong, very blunt: corolla lobes said to be yellow at the base, but in the picture the fls. have a white eye. Calif. B.M. 6396.—The largest flowered species.

ERYTHRÌNA (from Greek for *red*). *Leguminòsæ.* Coral Tree. Herbs, shrubs or trees, with large and showy papilionaceous fls., represented by 25–30 species in tropical countries. Lvs. pinnately 3-foliolate, with glanduliform stipules. Fls. mostly red and in dense racemes; calyx 2-lipped; standard free or very nearly so; tenth stamen free, or united only half its length: fr. a slender, more or less twisted pod. Plants usually spiny; very rapid growers. Erythrinas are much prized garden plants. Some of them, particularly the herbaceous kinds, are frequently planted out in the summer. In the house they demand an intermediate temperature. Give rich soil and frequent waterings. In the woody species, aim to have well-ripened wood for flowering, for the bloom is produced on wood of the preceding year. The herbaceous species are propagated by division of the rootstock; also by cuttings from shoots springing from the old roots. Woody species prop. by cuttings of growing wood. All species prop. by seeds, whenever these are obtainable.

A. *Herbaceous species* (*or treated as such*). These die down at the end of the season, and the roots may be stored after the manner of Dahlias. It is best to start the roots before planting them out, particularly in the N. In their native countries, these species are more or less woody.

Crísta-gàlli, Linn. (*E. laurifòlia*, Jacq.). Common Coral Tree. Bushy and woody, sometimes developing a very short trunk, but the flowering branches dying back after blooming, the stronger branches coming annually or periodically from near the root: stem and petioles somewhat spiny: lfts. ovate-oblong or lance-oblong, acuminate, entire: fls. large, brilliant crimson, the keel nearly as long as the down-folding standard, the wings rudimentary. Braz. B.M. 2161.—Runs into many forms, varying in the shade of red, some of them with variegated lvs. South of Washington, stands out of doors if protected. In the North the fleshy roots are taken up and stored. Valuable for summer bloom. Fls. in large, terminal racemes. Madame Belanger is a popular garden form.

compácta, Bull. Of very compact habit: fls. rich crimson. Probably a form of the last.

speciòsa, Andr. Bush-like, reaching 8–12 ft., but usually cut back as *E. Crista-galli* is: stems and lvs. prickly: lfts. broad and more or less 3-lobed, pointed, veiny: fls. in pubescent racemes, rich crimson. W. Ind. B.R. 9:750.—Stem green, very prickly.

herbàcea, Linn. Stems several and herbaceous, from a very thick root, 2–4 ft. high, the flowering ones nearly leafless: lfts. ovate to hastate: petioles long, more or less prickly: fls. 2 in. long and very slender, deep scarlet, in loose racemes 1–2 ft. long: seeds scarlet. N. Car. to W. Ind. Common on Gulf coast of Ala. and Miss. B.M. 877.—**E. Bídwillii**, Lindl., is a beautiful hybrid of this species and *E. Crista-galli* (the latter the pollen parent), with herbaceous shoots and an ascending vexillum. B.R. 33:9.

AA. *Woody or tree-like species.* Greenhouse plants, or planted in the open in S. Calif. and S. Fla.

Humeàna, Spreng. (*E. Cáffra*, Hort.). Often tree-like and 30 ft. or more, the stem and petioles very spiny: petioles long: lfts. rhomboid-ovate, acuminate: peduncles axillary and strictly erect, longer than the lvs., white-warty: fls. verticillate-spiked on the ends of the peduncles, long and slender, deflexed, brilliant scarlet fading to purple. S. Afr. B.M. 2431. B.R. 9:736.

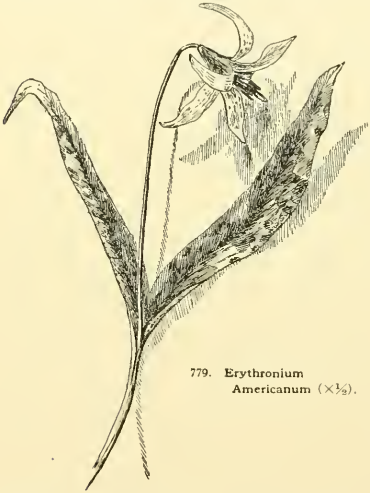
Corallodéndron, Linn. Coral Tree. Tree, prickly: lfts. ovate-rhomboid: calyx teeth obsolete; standard erect, linear-oblong, scarlet: seeds scarlet, usually with a black spot. W. Ind.

Other Erythrinas have been introduced into S. Calif.: *E. Bogoténsis*, said to grow 50 ft. high, from Colombia; *E. insígnis*, Todaro, of unknown habitat, 100 ft.; *E. viàrum*, Todaro, 100 ft., of unknown habitat.

L. H. B.

ERYTHROCHÆ̀TE, or **ERYTHROCHÆ̀TON**. See *Senecio Japonicus*.

ERYTHRÒNIUM (from the Greek word for *red*). *Liliàceæ*. Dog's-Tooth Violet. Adder's Tongue. Handsome plants of the north temperate zone. Four belong to the Old World, four to eastern N. America, one is found in the Rocky mountains, while in the cool woods and high mountains from northern California to the British possessions the genus is represented by nine species and a number of well marked varieties. Erythroniums have bulbs standing erect and from oblong to linear in form, two radical leaves, which in most species are handsomely mottled: scape slender and leafless, producing from one to many flowers. The perianth consists of six similar divisions, usually recurved, six stamens and a single 3-lobed style. The species are confused and are much in need of revision. See Watson, Proc. Amer. Acad. Arts & Sci. 14:260; 22:479. Baker, Journ. Linn. Soc. 14:296. Weathers, G.C. III. 20:361.



779. Erythronium Americanum (×½).

The Erythroniums are most interesting spring flowers. They succeed in any light soil, particularly in partial shade. In common with all herbaceous perennials, especially those which produce bulbs or corms, they profit by a winter mulch of leaves or litter. The western Erythroniums are all plants of the cool woodlands, except a few which grow at such altitudes as to reach like conditions. They thrive best in shade, a thoroughly drained soil, moist and rich in mold, a surface covering of half rotten leaves tending to equalize conditions. Any good fibrous material, as fibrous peat, cocoanut fiber or spent tan bark, or even well rotted sod, will answer the purpose to lighten the soil and give that abundance of mold they delight in. Pockets in shaded rockwork give ideal situations. They will thrive naturalized on cool, wooded slopes, and where the drainage is good will thrive in grass. The leaves ripen before the grass is cut and the effect is very fine. Simply planted in boxes in a loose soil, rich in mold, and left year after year in a shaded spot, they sometimes give splendid bloom. *E. Hartwegii* flowers very early, and stands more heat and dryness than any other variety. *E. purpurascens* and *E. montanum*, from high altitudes, tend to throw up their growth very late, and are on that account rather difficult to cult. *E. grandiflorum* flowers very early, and must be given a cool situation and be kept back, to secure any length of stalk. All of the other western species are very satisfactory garden plants. The propagation of *E. Dens-Canis* and varieties, the eastern American species and *E. Hartwegii*, is by offsets. All of the other western species can be increased only by seeds. The eastern species should be planted at least 5 in. deep.

A. *Fls. always solitary, and without a crest near base of inner petals: leaves handsomely mottled: offsets few.*—Old World species.

Dens-Cànis, Linn. The European species: in the type fls. are rosy purple or lilac: stem 4–6 in. high. Variations are white, rose-colored or flesh-colored. Var. **longifòlium**, Hort., varies in its narrower leaves and larger flowers. Var. **Sibiricum**, Hort., from the Altai Mts., is taller.—Little known in Amer. gardens.

AA. *Fl. solitary, without a crest on inner petals: producing offsets.*—Eastern American species.

Americànum, Smith. Common Adder's Tongue. Fig. 779. Lvs. mottled: fls. yellow; the segments recurved: bulb with long offshoots. Eastern U. S. and Canada, to Fla. and Ark. Runs into many forms. The following names belong with it: *E. lanceolàtum*, Pursh; *E. angustàtum*, Raf.; *E. bracteàtum*, Boott.

álbidum, Nutt. Lvs. not mottled, narrow: fls. white, yellow at base; segments recurved. Ont. and N. Y. to Tex.

mesachòreum, Knerr. Lvs. not mottled: fls. lavender, the segments not recurved: earlier than the last. Iowa to Kansas.

propùllans, Gray. Lvs. small, green or slightly mottled: fls. rose-colored, with yellow base: offsets produced from the stem sheath. Southern Ontario and Minnesota.

AAA. *Fls. 2–4, sometimes more (rarely only 1-fld.).*—West American species. The lvs. are richly mottled, except in *E. grandiflorum*. The corms do not produce offsets, except in *E. Hartwegii*. Inner petals with auricles except in *E. Howellii*. All except *E. purpurascens* have large and showy fls.

B. *Style 3-cleft.*

grandiflòrum, Pursh (*E. gigantèum*, Lindl.). Lvs. unmottled: stem slender, 1–5-fld.: fls. very bright yellow; petals recurved; anthers yellow.

Var. **álbum**, Hort. (*E. montànum*, Hort.). Like the type, except the fls. are white, yellowish at center, and with a slight greenish cast.

Var. **mìnor**, Morren, is smaller.

Nuttalliànum, Schult. Like *E. grandiflorum*, and perhaps a variety of it, but has red anthers.

Hártwegii, Wats. Bulb-bearing offsets: lvs. mottled: fls. 1–6, mostly in a sessile umbel, large, light yellow-orange at center. Foothills of the Sierra Nevada mountains in California. G.C. III. 20:361.

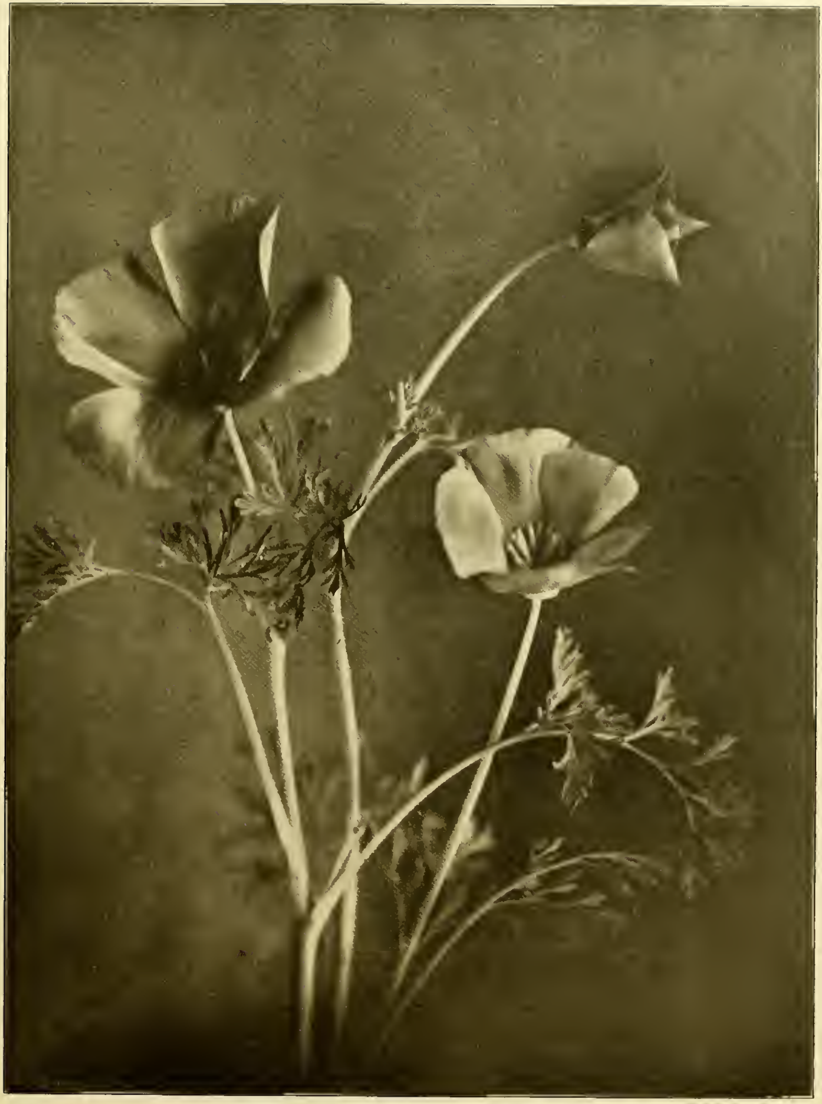
revolùtum, Smith. Lvs. 1–4, mottled in white and light brown: fls. nearly always 1 or 2; petals narrow and curved; style large and stout; filaments from subulate (awl-shaped) to deltoid, opening from white flushed with pink to pinkish purple, becoming purple. J.H. III. 35:523.

Var. **Bolánderii**, Hort. (*E. grandiflòrum*, var. *Smìthii*, Hook.). Differing from the type in having white fls., tardily becoming purple, and in being smaller.

Var. **Jóhnsoni**, Purdy (*E. Jóhnsoni*, Bolander). Very similar to the type, but lvs. mottled in dark brown and looking as if coated in varnish, and fls. dark rose with orange center. Gn. 51:1106. G.C. III. 19:549; 25:253.

Var. **prǽcox**, Purdy. Lvs. mottled in mahogany, the most beautifully in any Erythronium: the fls., usually 2–4, are creamy white with orange center.

Var. **Wátsoni**, Purdy. Differs in having a full, creamy white fl., orange at center, and usually banded with brown above the base; in foggy weather the fl. is bell-shaped: lvs. mottled in brown.—One of the finest of Erythroniums.



The California Poppy. Eschscholzia Californica

Var. **albiflòrum**, Hort. (*E. gigantèum*, var. *albiflòrum*, Hort. *E. grandiflòrum*, var. *albiflòrum*, Hook.). This differs from var. *Watsoni* only in being pure white, with a delicate greenish cast. B.M. 5714. F.S. 20:2117. G.C. III. 3:556; 15:621.

BB. *Style not divided.*

citrinum, Wats. Lvs. mottled: stem 1-3-fld.: petals broad, strongly recurved, light yellow, orange at center, the tips becoming pink.

Héndersonii, Wats. Lvs. mottled in dark brown: petals strongly recurved, pale purple, with a very dark purple, almost black, center. G.F. 1:317. G.C. III. 3:653; 15:623. B.M. 7017.

purpuràscens, Wats. Lvs. not mottled but shaded in dark metallic tints: small, spreading fls. crowded in a raceme, light yellow (almost white), center orange, becoming purplish.—The smallest of our Erythroniums. Properly an alpine.

Hówellii, Wats. Lvs. mottled: scape 1-3-fld.: fls. pale yellow with orange base, becoming pinkish.—Of the Pacific coast Erythroniums, this alone is destitute of the ear-shaped appendages at inner base of petal.

CARL PURDY.

ERYTHRÓXYLUM (Greek, *red wood;* true of some species). *Linàceæ*. COCA. The Coca plant, the lvs. of which are of vast importance in medicine, can be grown in the extreme south of Florida and California, and is rarely cult. under glass in the North for its economic interest. It is a shrub 5-6 ft. high, with rusty brown, slender branches, on the extreme tips of which the lvs. are borne. Below the lvs., on the wood of the preceding year, which is reddish, clusters of 3-5 yellow 5-lobed fls. a quarter of an inch across spring from the protection of the small scales that line the branchlets, and which are colored like the bark. The native country of the Coca being still uncertain, it is necessary for purposes of description to take as the type the earliest described form, which happens to be a Peruvian one, named by Lamarck *Erythroxylum Coca*, and figured in the Botanical Magazine 1894, plate 7334. The lvs. of this form are about 2½ in. long, oblong-obovate, tapering to a short stalk, rounded at the apex, the midrib extending beyond into a short, sharp point.

Coca is grown commercially on a large scale throughout South America. Peru produces fifteen million pounds of the dried leaf every year, Bolivia half as much, and the rest of South America very much more. The lvs. are chewed to prevent hunger and fatigue. Dr. H. H. Rusby, of New York, in the Therapeutic Gazette, says, "The effects of Cocaine as a nerve stimulus applied to intellectual and emotional activity are ruinous. It takes away appetite, abolishes the sensations of hunger and thirst, lessens waste during exertion, and decreases the exhaustion of ill-fed laborers and travelers. Beyond this, Cocaine has no supporting or nourishing power whatever, and its essential action is enfeebling. Every attempt made to support by it athletic competition has resulted in failure or even disaster." Cocaine is an excellent anæsthetic, and is particularly useful in operations on the eye. Coca should not be confused with Cocoa and Cacao, which are discussed under Theobroma. The literature of Coca, from every point of view down to the year 1889, is reviewed in the Kew bulletin for that year. W. M.

ESCALLÒNIA (Escallon was a Spanish traveler in S. Amer.). *Saxifragàceæ*. About 40 South American evergreen shrubs or trees, with scattered entire or serrate, ovate or lanceolate lvs., viscid branches, strong-odorous fls. in terminal racemes or panicles: petals 5, linear-spatulate; stamens 5; anthers ovate-oblong; style simple, the stigma capitate and 2-3-lobed: ovary 2-3-loculed. A few species have been introduced in the S., chiefly in S. Calif. They are of easy culture; rapid growers. Some of them will no doubt prove half hardy as far north as Washington. Spring and summer.

Montevidénsis, DC. (*E. floribúnda*, Hort.). Nearly erect bush, branches cylindrical: lvs. 2-4 in. long, elliptic or linear-oblong, obtuse or nearly so, narrowed into a distinct petiole, minutely dentate: fls. white, ½ in. across, in a large, terminal panicle-like cyme. B.M. 6404. B.R. 17:1467.

pulverulénta, Pers. (*E. Berteriàna*, DC.). Shrubs, hairy all over: lvs. elliptic and obtuse, serrate: fls. white, in erect, terminal racemes: branches trigonal.

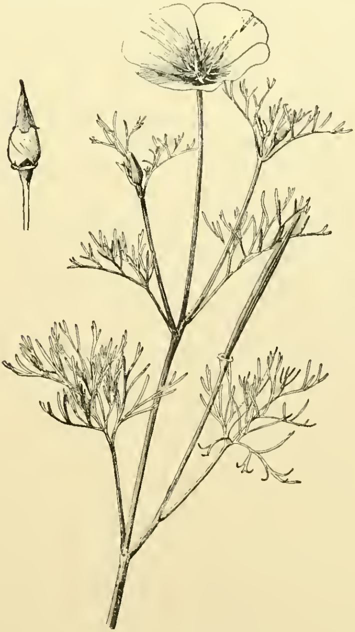
virgàta, Pers. (*E. Philippiàna*, Mast. *E. virgàta*, var. *Philippiàna*, Engl.). Half-hardy shrub south of Washington, with rod-like light brown branches: lvs. nearly sessile, not glandular nor odorous, linear or oblong-spatulate, serrate: fls. white, small, in dense racemes terminating the branchlets.

Organénsis, Gardn. Half hardy S., 2-5 ft., branches red and angled: lvs. elliptic or oblong, crowded, serrate, glossy: fls. pink, in close, terminal clusters. B.M. 4274. —Excellent.

rùbra, Pers. Twiggy shrub, glandular-pubescent: lvs. rather small, obovate-lanceolate, sharp-toothed: fls. long-tubular, red, in short, terminal clusters. B.M. 2890

L. H. B.

ESCHSCHÒLZIA (J. F. Eschscholz, of Kotzebue's scientific expedition). *Papaveràceæ*. About a dozen low, pale or glaucous herbs, annual or perennial, with dissected, alternate lvs., and large, showy yellow or whitish fls.: sepals 2; petals 4; stamens numerous; stigmas 4-6: capsule long and slender like a silique, 1-loculed. The calyx forms a hood which is pushed off over the bud as the petals expand (see detail at the left in Fig. 780). The torus or receptacle (from which the capsule arises) is prominently widened or dilated. Monogr. in Gray, Syn. Fl. N. Amer. 1:90-92. Commonly spelled Eschscholtzia.



780. Eschscholzia Californica (×½).

Califórnica, Cham. CALIFORNIA POPPY. Fig. 780. Perennial, but cult. as an annual, 10-20 in. high, forming mats: lvs. petioled and divided into linear parts:

fl. saucer-shaped, opening in sunshine, 2–3 in. across, yellow or orange or cream-colored: pod 3–4 in. long, strong-ribbed: torus large and funnel-shape. Calif. and Ore., mostly along the coast. B.M. 2887. B.R. 14:1168. R.H. 1894, p. 381.—One of the most popular garden fls. It is treated as a hardy annual. Seeds may be sown very early. It stands considerable cold, and blooms after the first frosts. If well protected, plants of one season's growth will pass the winter and give some bloom the following spring. It sometimes self-sows. Very attractive as an edging, because of its interesting bluish foliage. There are double-fld. forms. Very variable, and cult. under a variety of names, as *C. marítima*, Hort. (not Greene), *C. vària*, Hort. (trade name for mixed varieties), *C. aurantìaca*, Hort., and *C. álba*, Hort. The so-called white varieties are not yet pure white. Do not bear transplanting well.

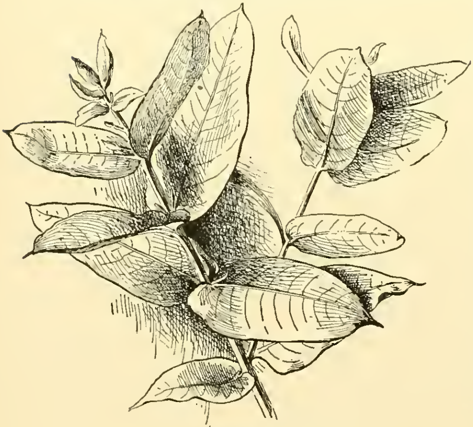
Var. **cròcea**, Hort. (*E. cròcea*, Benth.). Fls. deep orange: torus very widely expanded: calyx bud long-attenuate. B.R. 20:1677. B.M. 3495.

Var. **Doùglasii**, Gray (*E. Doùglasii*, Benth.). Rather more slender, and blooms earlier: fls. pure yellow.

tenuifòlia, Hook. Lower, with finer-cut and denser foliage, the long divisions being almost capillary: fls. small (1 in. across), light yellow, overtopping the lvs.: torus less prominent. Calif. B.M. 4812. L. H. B.

ESTRAGON. *Artemisia Dracunculus.*

EUCALÝPTUS (Greek, *eu*, well; *kalypto*, to cover as with a lid: the calyx limb covering the flower before anthesis, then falling off in the form of a lid or cover). *Myrtàceæ.* Gum Tree. Mostly trees, frequently of immense size; a few of the alpine and sub-alpine species shrubby: lvs. simple, entire (Fig. 781), in the seedlings and young shoots of many species horizontal, opposite, sessile and cordate; in the adult mostly vertical (occasionally horizontal), alternate, petiolate and varying from broadly ovate to lanceolate-acuminate and falcate, thick or thin, always rigid, penniveined, glabrous, except rarely in the young shoots, sometimes covered with a glaucous wax: umbels solitary and axillary or paniculate, near the ends of the branchlets, usually white: fls. in umbels of 3 to many, rarely solitary; calyx tube obconical campanulate or oblong, adnate to the ovary at the base; lobes connate, forming a lid which separates by a circumscissile dehiscence; petals wanting (or adnate to the calyx-lid); stamens numerous, in many rows, usually free, frequently inflexed in bud; anthers small, mostly distinctly longer than broad and opening by parallel longitudinal slits, often almost kidney-shaped and opening by divergent longitudinal slits, or truncate and opening by terminal pores; style undivided: fr. a capsule, opening at the top by 3–6 valves; seeds numerous, mostly angular, only a few fertile. For structure of fruit and calyptra, see Figs. 782–788. A genus of about 140 species, all Australasian, excepting perhaps 5 found in the East Indies. Valuable hardwood trees, mostly of rapid growth: the timber is exceedingly durable and largely used in Australia by shipbuilders, railroad engineers, implement makers, and for building purposes. Felling for timber should be effected towards the end of the dry season, when the flow of the sap is least active. Ring-barking, if necessary, should be performed during the latter part of the cool, or the earlier part of the warm season, so that by largely exhausting the sap, the fewest or no new shoots will rise from the root (Mueller). The leaves of many species contain a valuable antiseptic, volatile oil, which is distilled for pharmaceutical purposes. The bark of several species yields a resin (kino) containing tannin in commercial quantities, on account of which the name of Gum Trees is applied to the genus. *E. Globulus* has been very widely distributed over the globe through the persevering efforts of the late Baron Von Mueller; it is frequently planted in the malarial regions of warm climates, as at the Campagna at Rome, with very beneficial effect. (Sanitarians will be interested in "Eucalyptus in Algeria and Tunisia, from an hygienic and climatological point of view," by Dr. Edward Pepper, Proc. Amer. Phil. Soc. 35:39–56.) In England the same species is grown extensively for subtropical gardening, on account of its distinctive glaucous hue and symmetrical growth, but in that climate it needs the protection of glass in winter. But few species are really hardy; most of them, however, can be grown successfully in California and countries enjoying a similar climate.



781. **Eucalyptus Globulus** (×⅓).
Shoots on a young plant.

For ready determination of species in this critical genus, it is necessary to have adult leaves, mature buds, flowers, and mature fruit: immature fruits are often very misleading. Monographed in part by Baron von Mueller in his Eucalyptographia (cited here as F.v.M. Eucal.), in which 100 species are carefully illustrated. Bentham describes 135 species (almost the whole genus) in his Flora Australiensis, Vol. 3. The following key has been adapted from Luehmann's Dichotomous Key, published in 1898: the descriptions have been summarized from the Eucalyptographia, and subsequently verified by reference to herbarium specimens wherever these were available. References to Hook. Icon. mean Hooker's Icones Plantarum.

Culture in the East: Eucalypti are most easily raised from seeds, which generally germinate freely. These should be sown thinly in pots or pans of light, sandy soil, and placed in a little heat. *E. Globulus*, when intended to be used for subtropical bedding or for a group on a lawn, is best sown in August and grown on through the winter, for use the following season. In this way much larger and better plants may be obtained than when sowing is deferred to the spring. It is best to raise new plants each year, as lifted specimens do not regain their beauty of the preceding season. Being fast-growing plants, considerable space must be allowed when they become established, either in the open ground or in pots. A rather rich soil, composed of loam and decayed manure, with the addition of some charcoal, to keep it open, is most suitable. *E. maculata*, var. *citriodora*, is very useful for growing in pots in the conservatory, its lemon-scented leaves rendering it a general favorite (Nicholson).

Culture in the South: The process of raising Eucalypts is one of extreme simplicity. Well-ripened seeds, shallowly sown (on open nursery ground, or, should the species be a rare or select one, in wood boxes or seed pans) germinate quickly; when about hand-high the seedlings should be transplanted in the nursery, to check the downward growth of the roots and to promote the formation of lateral rootlets, fit to retain some soil while moving such seedlings to places of permanency. The operation of transplanting should be carried out in the cool season, best under a cloudy sky, and the seedlings ought not to get dried up in any way during the process of removal, regular daily watering for some time afterwards being requisite. Eucalyptus seedlings for shipment to places only a few days' distance may be simply packed in closed cases without much soil; for transmittal to longer distances, they must be well established in pots or bamboo pieces. In this respect Eucalypts should be treated like most pines and other coniferous trees, and, like them, cannot be transplanted when they have attained any size, even when provided with a good hall of earth. But their distribution by means of seeds is the easiest method, on account of the durability and small size of the latter. (F. v. Mueller: adapted).

INDEX.

acmenioides, 31.
albens, 3.
alpina, 35.
amygdalina, 47.
angustifolia, 47.
Baileyana, 42.
buprestium, 15.
calophylla, 5.
citriodora, 1.
coccifera, 44.
colossea, 11.
coriacea, 10.
cornuta, 37.
corymbosa, 4.
corynocalyx, 8.
crebra, 23.
diversicolor, 11.
doratoxylon, 9.
drepanophylla, 22.
ficifolia, 6.
fissilis, 18.
Globulus, 34.
gomphocephala, 33.
goniocalyx, 41.
Gunnii, 45.
hæmastoma, 46.
hemiphloia, 3.
Lehmanni, 36.
leptophleba, 22.
leucoxylon, 13.
longifolia, 12, 47.
maculata, 1.
marginata, 25.
megacarpa, 40.
melanophloia, 20.
melliodora, 19.
microcorys, 28.
obcordata, 39.
obliqua, 18.
occidentalis, 38.
pallens, 14.
paniculata, 7.
pauciflora, 10.
pilularis, 30.
piperita, 16.
Planchoniana, 17.
platypus, 39.
polyanthemos, 2.
punctata, 29.
regnans, 47.
resinifera, 26.
Risdoni, 32.
robusta, 24.
rosea, 14.
rostrata, 50.
rudis, 52.
saligna, 27.
siderophloia, 21.
sideroxylon, 14.
splachnicarpa, 5.
Stewartiana, 49.
tereticornis, 51.
triantha, 31.
uncinata, 43.
undulata, 45.
viminalis, 48.

A. *Fruit-valves quite enclosed in the capsule (see also No. 25, E. marginata: fruit must be quite mature in order to determine this point).*

B. *Fls. mostly in terminal or lateral panicles, not simple umbels (occasionally the inflorescence will appear to be paniculate in section* BB *also, owing to the falling off of the leaves, so that it is necessary to look for the leaf-scars in placing doubtful specimens): lvs. scattered, petiolate (except sometimes in seedlings and robust shoots).*

C. *Lvs. of equal color on both sides (see also No. 4 and No. 7, E. corymbosa and E. paniculata).*

D. *Fruit at least ⅓ in. in diameter, more or less urceolate: fls. and fruits pedicellate.*

1. **maculàta**, Hook. Spotted Gum. Handsome tree, 150 ft. high: bark smooth, whitish or reddish gray, mottled with bluish white or brown reddish spots: lvs. lanceolate; veins feathery-spreading: anthers opening by parallel longitudinal slits; lid double. F.v.M. Eucal. 3:4. Hook. Icon. 619.—Timber valuable for ship-builders, wheelwrights and coopers, and for blocks for street paving.

Var. **citriodòra**, Bailey (*E. citriodòra*, Hook.). Lemon-scented Gum. Handsome tree: trunk slender: bark smooth, white: branchlets long, slender and drooping: lvs. very long and narrow, light green, strongly lemon-scented: fls. creamy white. May–July.—A favorite ornamental tree, of rapid growth in the warmer parts of California: subject to frost. Timber valuable for piles and girders: volatile oil used in perfumery: the young plants useful for window or cool greenhouse culture.

DD. *Fruit rarely exceeding ¼ in. in diameter.*

2. **polyánthemos**, Schau. Red Box-tree. Well branched tree, from 40 ft. or less to 150 ft. high: bark brown or ash-gray, persistent, roughish: lvs. from orbicular to ovate, dull and grayish green on both sides: lid depressed- or pyramidal-hemispherical and faintly pointed: fls. small, white, in close panicles, described as resembling gigantic heads of mignonette; outer stamens sterile; fertile anthers truncated, opening by terminal pores. F.v.M. Eucal. 3:9. Hook. Icon. 879.—Fairly rapid grower. Timber extremely hard and durable, unsurpassed for fuel, and much used in Australia for ties and wheelwrights' work. Very useful for bees, flowering in Jan. and Feb.

3. **hemiphlòia**, F. v. M. Australian Box-tree. Tree, 90 ft. or less high: bark of trunk persistent, solid, grayish and somewhat wrinkled; of branches deciduous, in flakes or long strips: lvs. from lanceolate-falcate to ovate-lanceolate, thick and rigid, often ashy gray; lateral veins diverging at a very acute angle: lid conical: anthers very minute, globular, opening by lateral, pore-like apertures. F. v. M. Eucal. 5:5.—Timber hard and tough, valued in Australia for railroad ties, telegraph poles, shafts, spokes, etc.; also makes excellent fuel.

Var. **álbens**, Moore (*E. álbens*, Miq.). White Box-tree. Bark dull green, persistent: lvs. glaucous or mealy white: fls. chalk-white.

CC. *Lvs. paler beneath than above: branchlets glabrous.*

D. *Fruit urceolate (urn-shaped) over ½ in. long: lid of calyx not broader than the tube, tearing off along an irregular suture: anthers distinctly longer than broad, opening by almost parallel longitudinal slits.*

E. *Size of fruit under 1 in. in diameter.*

4. **corymbòsa**, Smith. Bloodwood. Small tree: outer bark persistent, rough-furrowed, gray and turning somewhat black; inner yellowish or reddish brown; that of the upper branches smooth and often reddish: lvs. lanceolate, only slightly curved, firm; midrib very prominent, lateral veins very numerous, fine, almost transversely spreading; oil-dots inconspicuous: peduncles and pedicels long, slender: fls. yellowish white, fragrant: lid depressed-hemispherical, short-pointed: fr. large, oval-urn-shaped. Aug.–Decem. F.v.M.Eucal. 5:2.—Timber very hard when dry, durable under ground, and much used in Australia for fence posts, rails, railroad ties, and rough building purposes: bark yields about 28 per cent tannic acid; dried lvs. about 18 per cent.

EE. *Size of fruit exceeding 1 in. in diameter: lvs. turning the surface more than the edge, to the zenith; veins feathery-spreading.*

5. **calophýlla**, R. Br. Medium-sized, umbrageous tree: bark persistent, dark, deeply furrowed: lvs. broad- or lanceolate-ovate, firm and thick, conspicuously stalked: fls. large, white, rarely pink, in large clusters: lid thin, patellar: fr. large, smooth, ovate-urn-shaped, border compressed; seeds very large, black, not winged. July–Oct. B.M. 4036 (as *E. splachnicarpa*). F. v. M. Eucal. 10:2. G.C. III. 20:661.—Ornamental tree, but of rather slow growth and subject to frost. Fruits polished and sold for pipe bowls: good shade-tree for avenues: valuable for bees, flowering late into the fall: bark contains tannin.

6. **ficifòlia**, F.v.M. Crimson-flowered Eucalyptus. Figs. 782, 783. Handsome, umbrageous dwarf tree or tall shrub, of symmetrical habit: bark persistent, furrowed: lvs. broad- or ovate-lanceolate, rigid, conspicuously stalked; veins almost transverse: fls. crimson or scarlet: fruits large, smooth, urn shaped-ovate; border compressed; seeds pale brown, broadly winged. Aug., Sept. F.v.M. Eucal. 7:3.—Very ornamental; adapted to the lemon-belt: a shady, heat-resisting avenue tree, withstanding drought. Fruits polished for pipe bowls.

782. Fruit and bud of E. ficifolia. (×⅓.)

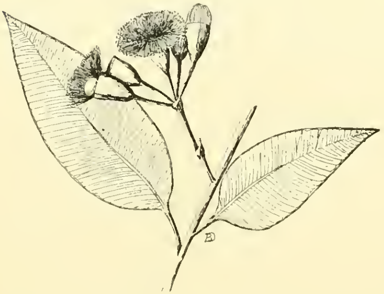
DD. *Fruit truncate-ovate, pedicellate.*

7. **paniculàta**, Smith. Red Ironbark. Medium-sized tree: bark persistent, hard, rough: lvs. rather thin: fls. sometimes borne in axillary umbels: lid thin, conical, semiovate; outer stamens sterile; anthers minute, truncate, opening by minute pores at the summit; stigma dilated, distinctly broader than the summit of the style: calyx-tube and fr. sometimes 4-ribbed. May. F. v. M. Eucal. 5:8.—Timber hard and durable, lasting under ground; valuable for railroad ties, fencing and building purposes.

BB. *Fls. in simple, axillary umbels: fr. with 3 or more cells, and not exceeding 1 in. in length.* (*See also E. paniculata, No. 7.*)

C. *Lid projecting beyond the rim of the calyx tube: anthers distinctly longer than broad, opening by almost parallel longitudinal slits.*

8. **corynocàlyx**, F. v. M. Sugar Gum. Tree, 120 ft. high: bark smooth: lvs. elongate-lanceolate, slightly curved, somewhat paler beneath: lid almost hemispherical: fr. urn-shaped-ellipsoid, longitudinally streaked. June–Sept. F. v. M. Eucal. 2:2.—The best drought-resisting tree for desert regions (Mueller); the foliage contains but little oil, is sweetish, and is browsed by stock. Needs protection from sea breeze when planted along the coast. An ornamental tree used for roadside planting in southern California. Timber hard, strong, durable; useful for railroad ties and fence posts. Said to be the quickest-growing shade tree for regions exposed to hot, bleak winds; will stand 18° F.



783. Eucalyptus ficifolia (×⅓).

CC. *Lid not projecting beyond the rim of the calyx-tube.*

D. *Lvs. opposite: anthers minute, not longer than broad (nearly oval), opening by longitudinal slits.*

9. **doratóxylon**, F. v. M. Spear-wood. A pretty, small tree or tall shrub: bark smooth, greenish white: lvs. stalked, narrow, lanceolate: umbels bent downward, on recurved, slender, compressed peduncles: lid terminating in a beak-like point: outer filaments sterile. F. v. M. Eucal. 4:4.—Graceful tree, of slender habit: timber firm and elastic.

DD. *Lvs. scattered.*

E. *Leaf-veins several, longitudinal, almost parallel with the midrib.*

10. **coriàcea**, Cunn. (*E. pauciflòra*, Sieb.). White Gum. Handsome tree: branches spreading; branchlets slender and more or less drooping: bark smooth, whitish gray: lvs. broad, elongated, thick: lid hemispherical, twice or thrice shorter than the tube, usually quite blunt: anthers almost kidney-shaped, opening by very divergent, longitudinal slits: fr. shortly-pedicelled. Nov.–Feb. F. v. M. Eucal. 3:6.—An alpine tree, and one of the hardiest species. Cattle browse on the foliage in seasons of drought. Timber used for fuel, fences and building purposes; sometimes badly affected with scale.

EE. *Leaf-veins all more or less diverging from the midrib.*

F. *Foliage much paler beneath (see also No. 25, E marginata): anthers almost heart-shaped, opening by longitudinal slits.*

11. **diversícolor**, F. v. M. (*E. colóssea*, F. v. M. *E. diversicolor*, var. *colossea*, Hort.). Karri. Very tall, symmetrical tree, attaining 12 ft. in diameter: bark smooth, white: lvs. scarcely inequilateral, dark green and shining above; veins feathery-spreading, fine: lid nearly hemispherical: fls. white, in heavy clusters; stamens all fertile. March–May, and again in Novem. F. v. M. Eucal. 5:4.—A rapid grower, profuse bloomer, and considered a good tree for bees. Timber elastic, valued for building purposes, shafts, masts and fence rails.

FF. *Foliage of equal color on both sides, or nearly so.*

G. *Pedicels elongated: lid conical.*

12. **longifòlia**, Link. Woollybutt. Tall tree: bark persistent, gray, rough or wrinkled, somewhat fibrous: lvs. elongated; veins very spreading: lid broadly conical, acute, pale: stamens all fertile; anthers cuneate- or oblong-oval, opening by longitudinal slits: stigma not dilated: fr. rather large, bell-shaped, semiovate, angular: margin outwardly ascending. F. v. M. Eucal. 2:4.—Flowering almost continuously. Valuable for bees.

13. **leucóxylon**, F. v. M. White Ironbark. Tall tree, usually branching below: bark mostly deciduous, smooth, pale: lvs. narrow-lanceolate, grayish or dull green: fls. usually in 3's, white or rarely pink: lid semi-ovate, pointed: outer stamens sterile; anthers truncated, opening by apical pores; stigma much dilated: fr. slightly contracted at the orifice, rarely slightly angular. Jan.–Apr. F. v. M. Eucal. 1:4.—Valuable bee tree, making an excellent honey. Timber superior to that of almost any other Eucalypt for certain purposes. Valued for hardness and durability; used by wagon- and ship-builders, also for railroad ties and underground work, for axe handles and for turning. Will grow on stony ridges not adapted to ordinary cultural purposes.

14. **sideróxylon**, Cunn. (*E. leucóxylon*, var. *sideróxylon*, Authors). Red Ironbark. Perhaps not specifically distinct from *E. leucoxylon:* usually not branched below: bark persistent, rough, dark red: lvs. green: fls. white or yellowish.

Var. **ròsea**, Hort. (*E. leucóxylon*, var. *ròsea*, Hort.). Lvs. green: fls. rose-colored. March, Apr.—A handsome form and profuse bloomer.

Var. **pállens**, Auct. (*E. leucóxylon*, var. *pállens*, Benth. *E. leucóxylon*, var. *pállida*, Hort. *E. sideróxylon*, var. *pállida*, Hort.). Lvs. silvery gray: fls. red.—A profuse bloomer.

GG. *Pedicels short or none: fertile seeds not winged.*

H. *Fr. much contracted at the orifice, nearly globular: outer anthers kidney-shaped, opening by divergent slits.*

15. **bupréstium**, F. v. M. Shrub, 10 ft. high: lvs. about 2 in. long, narrow; oil-dots much concealed: fls. small, almost pear-shaped in bud: lid hemispherical, pointed: inner anthers opening by large, roundish pores: fr. nearly 1 in. in diam., truncate-globular, grayish; margin compressed. July, Aug. F. v. M. Eucal. 6:1.—Valuable for bees.

16. **piperìta**, Smith. Peppermint Stringy-bark. Tall tree: bark persistent, gray, rough and fibrous: oil-dots copious, transparent: lid broad-conical, acute: fr. about ¼ in. in diam. F. v. M. Eucal. 3:8.

HH. *Fr. but slightly or not at all contracted.*

I. *Diameter of fr. nearly 1 inch.*

17. **Planchoniàna**, F. v. M. Tree, 100 ft. high: peduncles erect, broadly compressed: pedicels very short or almost none: lid narrow-conical, from a semi-ovate base, about as long as the calyx-tube, both longitudinally streaked: anthers ovate or roundish ovate, opening by longitudinal slits. July. F. v. M. Eucal. 4:6.—A profuse bloomer. Timber heavy, hard and durable; well adapted for sawing, but not easy to split.

II. *Diameter of fr. rarely exceeding ½ in.*

J. *Calyx-tube and lid granular, rough.*

18. **oblìqua**, L'Her. (*E. fissilis*, F. v. M.). Stringy-bark. Tall tree: bark persistent, grayish, very fibrous, but rather soft and fragile: lvs. very inequilateral at base: peduncles nearly terete, mostly slender: calyx tube terete: lid hemispherical, depressed or scarcely pointed. March–May. F. v. M. Eucal. 3:5.—Much valued in Australia for bees. Will grow on poor, dry soil, but subject to frost in California. Wood useful only for cheap, rough work.

JJ. *Calyx-tube and lid smooth.*

19. **melliodòra,** Cunn. HONEY-SCENTED GUM. Spreading tree, 120 ft. high: bark more or less persistent below, roughish, brownish gray without, yellowish within: fls. small: lid conic-hemispherical: outer stamens sterile; anthers minute, truncated, opening by terminal pores: fr. truncate-globular, not exceeding ⅓ in. in diam., mostly 4-celled. Feb.–Apr.—F.v.M. Eucal. 2:5.—Timber used by wheelwrights and ship-builders; makes excellent fuel: fls. particularly rich in nectar, and much sought by bees.

AA. *Fruit-valves either quite exserted or the points reaching the level of the rim. (Fruit must be fully mature in order to render this point determinable.)*

B. *Fls. generally panicled: anthers renate-cordate, opening by longitudinal slits: lvs. of equal color on both sides.*

C. *Lvs. opposite, more or less ovate.*

20. **melanophlòia,** F. v. M. SILVER-LEAVED IRONBARK. Small tree: bark persistent, deeply furrowed, blackish: lvs. glaucous or mealy white, sessile, from cordate-ovate or orbicular to ovate-lanceolate, obtuse or acute: peduncles 3- to 8-flowered: anthers very small and globular; cells parallel and distinct: fr. truncate-globular, 2 or 3 lines long.

CC. *Lvs. scattered, lanceolate.*

21. **siderophlòia,** Benth. LARGE-LEAVED IRONBARK. Tree, 150 ft. high: bark wholly persistent, deeply and somewhat anastomosingly furrowed; furrows yellowish or dark brown: lvs. elongated: lid conical, very acute, about 3 lines long: outer filaments straight in bud; anthers very minute, roundish; stigma not dilated. October. F. v. M. Eucal. 4:8.—Timber very strong, bard and durable; used for railroad ties, wharf piles, spokes and tool-handles.

22. **drepanophýlla,** F. v. M. Low, stunted tree: bark ribbed, dark gray: lvs. thin, often over 6 in. long; veins fine, numerous, parallel and very diverging: umbels 3- to 6-flowered: fls. large; calyx-lid about as long as the tube (not exceeding 2 lines long): fr. 3 to 4 lines in diameter; valves level with or hardly projecting beyond the rim. Said to be near *E. crebra*, differing mainly in the large flowers and in the larger, harder and more globular fruit.

Var. **leptophlèba,** Luehm. (*E. leptophlèba*, F. v. M.), is said to be chiefly distinguished by the lvs. being thicker and the veins more oblique. Timber strong, hard and very durable; used for bridges, mine props and fence posts.

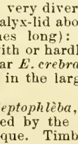
23. **crèbra,** F. v. M. NARROW-LEAVED IRONBARK. Tall tree: bark persistent throughout, dark, almost blackish, ridged and deeply furrowed, solid: lvs. narrow, linear-lanceolate, thin: lid semiovate-conical, not exceeding 2 lines long: filaments inflexed in bud; stigma dilated: fruit-valves level with or hardly projecting beyond the rim, not exceeding 2 lines in diameter. F. v. M. Eucal. 5:3.—Timber heavy, hard, elastic and durable; used for railroad ties, piles, fence posts, and in the construction of bridges and wagons; also suitable for splitting into palings.

BB. *Fls. mostly in simple axillary umbels: fruits not exceeding 1 in. in diam.*

C. *Lvs. paler beneath.*

D. *Calyptra lid broader than the calyx-tube.*

24. **robùsta,** Smith. SWAMP-MAHOGANY GUM. Fig. 784. Handsome, symmetrically branching tree, 100 ft. high: bark of trunk persistent, rough, dark brown; of the branches reddish: lvs. large, oval-lanceolate, long-pointed, dark green, coriaceous; the veins almost horizontally spreading: peduncles broadly flattened: fls. large, creamy white; calyx pale; lid hemispherical below, cylindric-conical pointed above; anthers oblong-oval, opening by parallel longitudinal slits. Fine avenue tree; profuse bloomer, especially valuable for bees. Dec.–Feb. F.v.M. Eucal. 7:8.—Timber remarkably durable; used for ship-building, wheelwrights' work, mallets, etc.: seems to thrive well in low, sour, swampy ground near the seacoast.



784. Fruit and buds of E. robusta (×⅓).

DD. *Calyptra lid not broader than the calyx-tube.*

E. *Fruit ½ in. or more in diameter.*

25. **marginàta,** Smith. JARRAH. Tall tree: bark persistent, somewhat fibrous: leaf-veins spreading: lid conical: stamens all fertile, the outer not inflexed in the bud; anthers cordate-kidney-shaped, opening by divergent longitudinal slits: fr.-valves very short, scarcely or not at all exserted. Apl., May. F. v. M. Eucal. 7:5.—Valuable hardwood tree, requiring a warm climate: timber not attacked by teredo; used for wharf piles, underground work, telegraph poles, railroad ties, floorings, rafters, shingles and furniture; it is easily worked, makes a fine finish, takes a good polish; used in England for street paving.

EE. *Fruit under ½ in. in diameter.*

F. *Length of lid usually twice or thrice that of the calyx tube.*

26. **resinífera,** Smith. KINO EUCALYPT. Tall tree: bark of trunk persistent, rough, of branches deciduous: leaf-veins pinnately spreading: oil-dots pellucid, more or less obliterated: lid conical: stamens all fertile, inflexed in the bud; anthers longer than broad, opening by parallel longitudinal slits. F. v. M. Eucal. 1:9.—Timber valued for its strength and durability; particularly good for fuel; used in Sydney for street paving.

FF. *Length of lid shorter than or equaling that of the calyx-tube.*

G. *Foliage much paler beneath: lateral veins numerous, very spreading.*

27. **salígna,** Smith. Tall tree: bark gray and smooth: leaf-veins feathery-spreading: oil-dots numerous but much concealed: peduncles broadly compressed; pedicels very short or none: lid hemispherical, short pointed: stamens all fertile; anthers longer than broad, opening by parallel longitudinal slits. Nov. F. v. M. Eucal. 2:8.—Said to be hardier than *E. Globulus*; prefers rich, alluvial soil.

28. **microcòrys,** F.v.M. TALLOW-WOOD GUM. Tall tree: bark persistent throughout, wrinkled: lvs. thin, of almost papery consistence, copiously dotted with pellucid oil-glands, paler and opaque beneath; veins spreading: pedicels elongated, club-shaped, almost continuous with the calyx tube: lid depressed-hemispherical, hardly jointed: anthers very minute, almost heart-shaped, opening by divergent slits. F.v.M. Eucal. 2:6.—Timber hard, durable, easily worked; used preferably for wood bricks; also for railroad ties, knees and breast-hooks in ship-building, and telegraph poles.

GG. *Foliage slightly paler beneath, the lateral veins not very close and moderately spreading.*

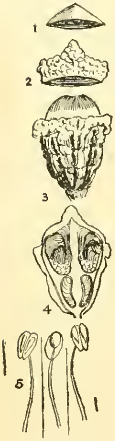
H. *Fruit broadest at the orifice: fertile seeds much larger than the sterile ones: stamens all fertile: anthers longer than broad, opening by parallel longitudinal slits.*

29. **punctàta,** DC. LEATHER-JACKET. HICKORY GUM. Beautiful spreading tree, 100 ft. or more high: bark smooth and dark, thick, most of the outer deciduous: lvs. thin; veins divergently spreading: peduncles broad, strongly compressed: pedicels angular, thick: lid bluntly conical. F.v.M. Eucal. 6:7.—Timber hard, tough and very durable, suitable for fence posts, railroad ties, wheelwrights' and ship-builders' work.

HH. *Fruit contracted at the orifice: fertile seeds not much larger than the sterile ones: stamens all fertile: anthers kidney-shaped, opening by divergent longitudinal slits.*

30. **pilulàris,** Smith. BLACKBUTT. Tree, 300 ft. or less high: bark of trunk persistent, blackish gray outside, somewhat fibrous and brownish inside; of branches smooth, gray or whitish: lvs. rather less shining below than above: peduncles strongly compressed: lid attenu-

ate, from a broadly conical base: fr. about 4 lines in diameter; rim thick. F.v.M. Eucal. 3:7.—Timber suitable for floor boards, railroad ties, telegraph poles, and wood bricks for street paving.



785. **Eucalyptus Globulus.**

786. **Eucalyptus Globulus.** Showing spray of mature foliage (×⅙) and two leaves of sucker foliage.

31. **acmenioides**, Schau. (*E. triántha*, Linn. *E. pilulàris*, var. *acmenioìdes*, Benth.). White Mahogany Gum. Tall tree: bark of trunk persistent below, fibrous: peduncles not much compressed, slender: lid hemispherical, pointed at the summit: fruit not exceeding 3 lines in diameter; rim thin. F.v.M. Eucal. 10:1.—Timber heavy, strong and durable; good for palings, rails, floor boards, etc.

cc. *Lvs. of equal color on both sides.*

d. *Mostly opposite lvs., not connate (except sometimes in No. 32, E. Risdoni); margin entire: fruit rarely exceeding ½ in. in diameter, truncate-ovate.*

32. **Rísdoni**, Hook. Drooping Gum. Small or medium sized tree: bark deciduous, smooth: branches usually pendulous, bark brown or ashy white: lvs. acute, ovate: lid hemispherical, obtuse: anthers kidney-shaped, opening by divergent longitudinal slits. Closely related to *E. amygdalina*.

dd. *Mostly scattered lvs.: fls. and fruits sessile or on short pedicels.*

e. *Lid much broader than the calyx-tube.*

33. **gomphocéphala**, DC. Tooart Tree. Tree, 120 ft. or less high: bark persistent, rough but not stringy, rather dark on old trunks, smooth and grayish on younger trees and branches: lvs. thick, narrowly acuminate, pale green: peduncles broadly flattened; pedicels wanting: lid almost hemispherical: fr. large, top-shaped; border broad, convex. Nov. F.v.M. Eucal. 7:4.—A very distinct species, easily distinguishable by the broad lid. Timber tough, heavy and rigid, texture close, grain twisted, shrinks but little and does not split while seasoning; suitable for large scantlings where great strength is needed, also in ship-building and for bridge supports. One of the strongest woods known.

ee. *Lid not or only slightly broader than the calyx-tube.*

f. *Calyx-tube and lid warty; anthers larger than broad, opening by nearly parallel longitudinal slits.*

34. **Glóbulus**, Labill. Blue Gum. Figs. 781, 785, 786. Tree, 300 ft. or less high: bark grayish or bluish white, smooth except at the base of the trunk: lvs. lanceolate, thick: calyx-tube and lid covered with bluish white wax: fr. large, angular. Dec.–Feb. F.v.M. Eucal. 6:2. G.C. II. 15:601; Ill. 2:784; 10:737.—Very attractive to bees, but the nectar has a strong and unpleasant odor. In California more extensively planted than any other Gum, and readily spreading by voluntary seedlings. Will stand protracted drought without irrigation in a region of only 8 or 10 inches annual rainfall (Franceschi). The most rapid-growing species. Timber used in Australia by ship-builders for planking and keels; also for fence rails, telegraph poles, railroad ties, shafts and spokes. It has been recommended for wine casks. Will tolerate 19° F. Fig. 785 shows the stamens (5) and the structure of the bud. Nos. 1–4 are ½ nat. size; 5 is on a larger scale. No. 4 is a section of a bud.

35. **alpina**, Lindl. Shrub, 12 ft. high: lvs. inequilaterally half-ovate, blunt, acute on young shoots, leathery: fls. sessile in the leaf axils, solitary or few: fr. large, 8 lines wide, almost hemispherical, not angular. Sept.–Nov. F.v.M. Eucal. 2:1.—A very rare and interesting alpine species, possibly suitable for street planting.

ff. *Calyx-tube and lid smooth or rough, but not warty: lvs. much exceeding 1 in. in length.*

g. *Stamens not inflexed in the bud (see also No. 51, E. tereticornis): peduncles broadly flattened: calyx lid long, cylindrical, obtuse: anthers ellipsoid, opening by parallel longitudinal slits.*

36. **Léhmanni**, Preiss. Tall shrub or small tree: bark coming off in irregular sheets, roughish and reddish: fls. greenish yellow; calyx lid often 1½ in. long: ovary convex at the top: fr. half immersed in the receptacle, about ½ in. in diameter; valves connivent into a cone, tapering into the persistent base of the style. July–Sept.—Valuable ornamental tree.

37. **cornùta**, Labill. Yate Tree. Large tree: calyx lid 1–1¼ in. long: filaments yellow: ovary almost on a level with the calyx rim, the top flat or at length slightly convex; style thickened at the base: fr. free (not immersed in the receptacle). July–Sept. F.v.M. Eucal. 9:1.—Closely related to the preceding. Used successfully as a roadside tree in southern California; adapted to the lemon belt, and tolerating alkaline and saline soils (Franceschi). Prefers a somewhat humid soil. Timber hard, tough and elastic, suitable for shafts and frames of carts, and considered equal to ordinary ash wood. B. M. 6140.

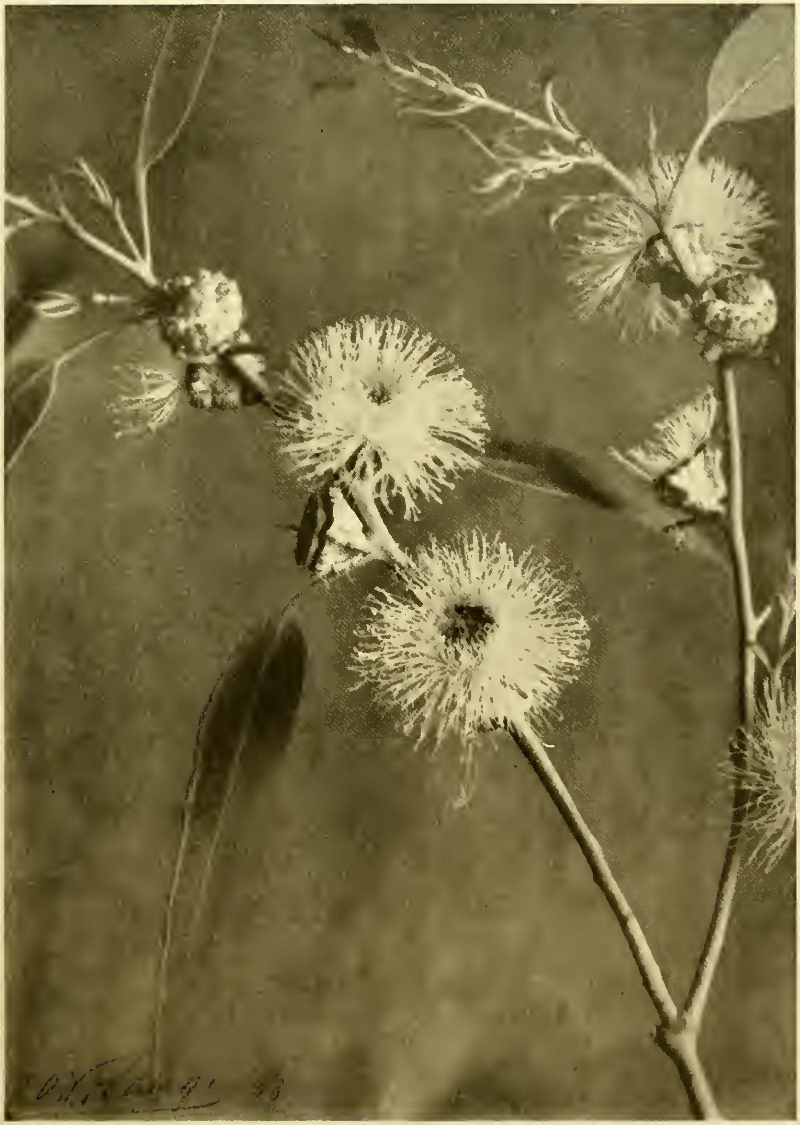
787. Fruits and buds of E. occidentalis (×⅓).

38. **occidentàlis**, Endlich. Flat-topped Yate. Fig. 787. Tall tree: bark deciduous, mostly smooth: lvs. narrow-lanceolate: calyx lid ½–¾ in. long; filaments yellowish: fruit-valves only half exserted, awl-shaped, free. F. v. M. Eucal. 6:5.—Individuals show great diversity in time of flowering, so that specimens may be found in blossom at any time between August and April.

39. **plátypus**, Hook. (*E. obcordàta*, Turcz.). Tall shrub, 30 ft. or less high: bark smooth, grayish: lvs. petiolate, leathery, broad-obovate, blunt, shining: peduncles flattened and winged, bent downwards: fls. sessile, dull red or yellowish white, not conspicuous: calyx-tube prominently angular, much broader than the conic-cylindrical lid: fr. truncate-ovate, very angular, border compressed; flowering almost continuously, but never much at a time. F.v.M. Eucal. 7:6. Hook. Icon. 849.

gg. *Stamens inflexed in the bud: fruits from ½ to 1 in. in diameter.*

40. **megacárpa**, F.v.M. Tree, 100 ft. or less high: bark deciduous, smooth, grayish white: peduncles sharply 2-edged and dilated upwards: fls. 1–2 or 3, ses-



The Blue Gum (Eucalyptus Globulus), the best known of the genus in this country

sile; anthers with a large dorsal gland near the apex: fr. large, slightly angular-streaked; valves thick, convergent, emersed; border broad, depressed. F.v. M. Eucal. 6:3.

GGG. *Stamens inflexed in the buds: fruits mostly under ½ in. in diameter: lvs. lanceolate, rarely linear: calyx-tube and lid not ribbed.*

H. *Calyx-tube angular: pedicels flattened.*

41. **goniocàlyx**, F. v. M. Bastard Box Tree. Tall tree: peduncles compressed: pedicels very short and angular or wanting; calyx-tube conspicuously angular: lid pyramidal-hemispheric: fr. angular: valves deltoid, almost enclosed. August. F. v. M. Eucal. 1:3.—Ascends to 4,000 ft. elevation. Timber especially esteemed for wheelwrights' work; also used for house-building, fence rails, etc.; excellent for fuel.

HH. *Calyx-tube and pedicels terete: fr.-valves short, often deltoid.*

I. *Capsule inserted below the rim of the calyx-tube, or on a level with it.*

J. *Frs. urceolate (i.e., urn-shaped).*

42. **Baileyàna**, F. v. M. Tall tree: bark persistent throughout, fibrous: foliage dense and shady: lvs. much dotted: anthers broadly cordate, opening by divergent slits: fr. rather large, globular-urn-shaped, 3-celled; valves deltoid, slightly exserted. F. v. M. Eucal. 3:1.—Will grow well on sandy soil. Timber splits easily, is tough and durable; used for fence posts, etc.

JJ. *Frs. mostly ovate-truncate, never urceolate: pedicels short; calyx-lid hemispherical, mostly blunt and shorter than the tube.*

K. *Leaf-veins fine, numerous, very divergent.*

43. **uncinàta**, Turcz. Shrub, branching from near the base with several thin stems: bark deciduous, smooth and grayish or reddish: lvs. firm, very light green, narrow: fls. small; stamens remaining bent inward in anthesis; anthers very minute, almost globular, opening by terminal pores: fr. very small. F. v. M. Eucal. 4:10. —A very hardy species.

KK. *Leaf-veins not numerous, very oblique.*

44. **coccífera**, Hook. Small, glaucous tree: lvs. thick and shining. under 3 in. long: peduncles short, thick and much flattened upwards: calyx-tube narrow-turbinate, tapering at the base, prominently angled: lid short, broad, flat or depressed, rugose: anthers kidney-shaped, opening by divergent, longitudinal slits: fr. almost flat on the top. Tasmania, 3,000–4,000 ft. elevation. B.M. 4637. G.C. II. 12:113; 13:395; III. 2:787, 789; 3:799, 801; 9:169.—Perhaps only a sub-alpine form of *E. amygdalina*.

45. **Gúnnii**, Hook. Cider Gum. Small, often scrubby tree: lvs. thick, shining, less than 3 in. long: calyx-lid shining, hemispherical, short-pointed: anthers almost oval, opening by parallel longitudinal slits: capsule somewhat sunk below the narrow rim of the calyx-tube. A very hardy species. Cattle and sheep readily browse on the foliage, as it lacks the peculiarly pungent Eucalyptus odor. May, June. G.C. II. 19:437; III. 2:781; 11:787.

Var. **undulàta**, (*E. Gúnnii*, F. v. M. Eucal. 4:5., not of Hook. *E. undulàta*, Luehm., not of F. v. M.). Swamp Gum. Tall tree: lvs. longer (over 3 in.), broad and somewhat undulate: fr. top-shaped.—Yields a great deal of nectar, and flowers earlier than *E. viminalis*. Timber strong and useful.

JJJ. *Frs. ovate or globose, truncate: rim rather broad and flat; anthers broader than long almost kidney-shaped, opening by divergent longitudinal slits: lvs. green: bark of trunk smooth or fibrous.*

46. **hæmastòma**, Smith. White Gum. Tree: lvs. broad; veins spreading, prominent: outer stamens sterile: fr. short, ovate-truncate, with a reddish apex. F. v. M. Eucal. 2:3.—Will grow on poor, sandy land. Timber of inferior quality.

47. **amygdalìna**, Labill. Peppermint Gum. Tall tree: bark persistent on trunk and lower branches, fibrous: lvs. rather small, narrow-lanceolate, attenuate into the petiole; veins not much spreading; oil-dots large and not very numerous, translucent: fr. globose, truncate or shortly ovate. F. v. M. Eucal. 5:1. B.M. 3260. B.R. 11:947 (as *E. longifolia*). G.C. III. 6:16. —Timber not strong, but suitable for shingles, rails, staves, inner building material, etc. Foliage yields more volatile oil than that of any other species tested.

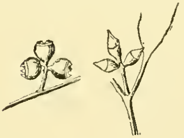
Var. **régnans**, F. v. M. Giant Gum. Very tall tree, (415 ft. or less high): bark usually smooth, whitish, fibrous only near the base: lvs. large, broad-lanceolate; oil dots very fine, numerous.

Var. **angustifòlia**, F. v. M. Graceful, spreading tree: branchlets drooping: lvs. very narrow: fls. very numerous in the umbel. Jan.–Apl., and more or less throughout the year.

II. *Capsule raised above the rim of the calyx-tube: lvs. mostly large, inequilateral; veins very diverging: stems of young plants nearly terete: anthers longer than broad, opening by parallel longitudinal slits.*

J. *Flowers mostly three in an umbel.*

48. **viminàlis**, Labill. Manna Gum. Fig. 788. Tall and graceful. spreading tree, 300 ft. or less high: bark persistent, roughish and dark-colored (never fibrous), or deciduous, very smooth and grayish white: seedling leaves lanceolate: pedicels almost none or very short: lid semi-ovate, mostly short-pointed. F. v. M. Eucal. 10:10. G.C. III. 4:597.—A hardy species, withstanding considerable frost and strong winds. Timber not as strong as that of many other species, but frequently employed for shingles, fence rails and ordinary building purposes. Sheep will feed on the foliage. A valuable bee tree. Growing readily in California from voluntary seedlings. Seed said to retain its vitality ten years.



788. Fruits and buds of E. viminalis (×½).

JJ. *Flowers more than three in an umbel.*

49. **Stuartiàna**, F. v. M. Apple-scented Gum. Tall, branching tree, with dense, drooping foliage; closely related to *E. viminalis*, and distinguishable from the latter when it has more than 3 flowers in an umbel, by the fibrous bark and roundish seedling leaves: pedicels almost none: calyx-lid almost hemispherical or shortly and bluntly conical. March–May. F.v.M. Eucal. 4:9.—One of the hardiest species: timber used mostly for fencing and fuel.

50. **rostràta**, Schlecht. Red Gum. Tree, 200 ft. or less high: bark early deciduous, smooth, ashy gray or whitish: pedicels conspicuous: calyx-lid acuminate, usually ending in a beak (occasionally blunt). Apl., May. F. v. M. Eucal. 4:7.—Useful for bees. Prefers a moist soil with a clayey subsoil; thrives in ground periodically inundated for a considerable time, and even in slightly saline places: stands 22° F. in Italy. Timber hard, heavy, strong and extremely durable, either above or under ground or in water; suitable for fence posts, piles and railroad ties; also extensively used in shipbuilding and for wood bricks for street paving; said to make a better fuel than wood of *E. Globulus*. Somewhat hardier than *E. Globulus*.

51. **tereticórnis**, Smith. Flooded Gum. Tall tree: bark smooth: peduncles elongated: pedicels conspicuous: calyx-lid conical, not beaked, often much elongated: fr. almost globose through the broad, ascending rim. Apr., May. F. v. M. Eucal. 9:8.—Closely related to *E. rostrata*. Will thrive on undrained ground. Timber used by wheelwrights.

52. **rùdis**, Endl. Tree, 80 ft. high, or less: bark persistent, rough: peduncles ⅓–1 in. long: pedicels short: calyx-lid conical, not beaked; commissural line between calyx tube and lid prominent: rim of fr. only slightly ascending. Sep.–Nov. F. v. M. Eucal. 10:8.—Stands drought better than many others, and promises

to make a beautiful avenue tree; young growth of a deep copper color; adapted to the lemon belt (Franceschi).

E. botryoìdes, Smith. Placed next after E. robusta in the key. Tall tree: lid not broader than the angular calyx tube. F. v. M. Eucal. 4:2. Timber valuable.—*E. citriodòra*, Hook.= maculata, var. citriodora.—*E. decipiens*, Endlich. Placed next after E. goniocalyx in the key. Tree, 70 ft. high: calyx tube and pedicels terete: capsule raised above the rim of the calyx tube: fr.-valves ending in 5 points. F. v. M. Eucal. 10:3.—*E. eugenioìdes*, Sieb. WHITE STRINGY-BARK. Placed second after E. Gunnii, var. undulata, in the key. Tree, 200 ft. high: fls. more than 3 in an umbel: fr. ovate or globose, truncate: rim narrow, the valves inserted somewhat below it. March–Sept. F. v. M. Eucal. 10:4. Timber valuable.—*E. eximia*, Schauer. MOUNTAIN BLOODWOOD. Placed next before E. maculata in the key. Tree, about 80 ft. high: fls. cream-colored, sessile, in Oct. frs. sessile. F. v. M Eucal. 9:2. Wood makes good fuel. Handsome tree when in blossom.—*E. incrassàta*, Labill. MALLEE. Placed after E. Planchoniana in the key. Shrub or small tree: frs. rarely exceeding ½in. in diam.: peduncles erect, short and thick, usually much flattened. F.v.M. Eucal. 5:6. "Will live in mere sand and brave the most scorching hot winds, but will bear some frost. The lvs. supply a considerable proportion of the mercantile Eucalyptus oil."—*E. macrorhýncha*, F. v. M. Placed before E. viminalis in the key. Leaf-veins very oblique: fls. and frs. on short pedicels: lid conical: anthers kidney-shaped, opening by divergent longitudinal slits. F. v. M. Eucal. 1:5.—*E. microthèca*, F. v. M. Placed next to E. siderophloia in the key. Lid not exceeding 2 lines in length: fr.-valves much exserted. F. v. M. Eucal. 10:6. One of the best trees for desert tracts; tolerates the intense, scorching heat of a desert summer, and a winter temperature of 18° F. Timber valuable for cabinet work, etc.—*E. miniàta*, Cunn. Placed after E. paniculata in the key. Fls. in simple umbels, brilliant orange-color: fr. with 3 or more cells, nearly 2 in. long. F.v.M. Eucal. 6:4. A handsome ornamental tree.—*E. obtusiflòra*, Auct.=virgata (below).—*E. pinnàta*, a garden name. Is a synonym of some other species.—*E. tetrâptera*, Turcz. Shrub, 10 ft. high: fls. very large, axillary, solitary, on a recurved, flat, and very broad peduncle; calyx tube almost obverse-pyramidal, sharply quadrangular, broader than the pyramidal-conical lid: stamens red. F. v. M. Eucal. 2:10. One of the most ornamental species of the genus.—*E. virgàta*, Sieb. (E. obtusiflora, DC.). Placed second after E. obliqua in the key. Shrub, 10–15 ft. high: bark smooth: lvs. large, falcate: umbels generally enclosed in large bracts while in bud.

J. BURTT DAVY.

EUCHARÍDIUM (from the Greek for *charming*). *Onagràceæ*. Two Californian herbs allied to Clarkia, but differing in having the calyx tube much prolonged beyond the ovary, stamens 4 and opposite the sepals and not appendaged at the base. **E. concínnum**, Fisch. & Mey. (*E. grandiflòrum*, Fisch. & Mey.), is a graceful garden annual, growing 1 ft. high. Pubescent or glabrous: lvs. small, oblong, petioled, entire: fls. rose-colored, nearly or quite an inch across; calyx tube filiform, an inch or more long; filaments filiform; petals 3-lobed. Of easy culture in any garden soil. B.R. 23:1962. B.M. 3589. R.H. 1846:81; 1857, p. 299. **E. Bréweri**, Gray, is an annual 1 ft. high. Lvs. 1 in. or more long, narrow-lanceolate: petals large, obcordate, with a narrow lobe in the deep terminal sinus: filaments club-shaped.

L. H. B.

EÙCHARIS (*very graceful*, from the Greek). *Amaryllidàceæ*. Perianth tube straight or curved, the throat dilated; segments broad and spreading; perianth cup either entire or toothed between the filaments: ovules 2 to many in each of the 3 locules: fls. white, in umbels, very showy, standing on long, stout scapes: lvs. broad-ovate, narrowed into distinct petioles. Six or eight handsome species from Colombia. Rootstock short and bulb-like. The species are confused. *E. grandiflora*, *E. candida* and *E. subedentata* are the well-marked types. The fls. in Fig. 789, adapted from authentic plates, will distinguish the types. Hybridizes with Urceolina (see *Urceocharis*). Monogr. by Baker, Amaryllideæ.

L. H. B.

The Amazon Lilies, as Eucharis are popularly called, are among the most desirable of warmhouse bulbous plants, being not only very beautiful but also very free in the production of flowers.

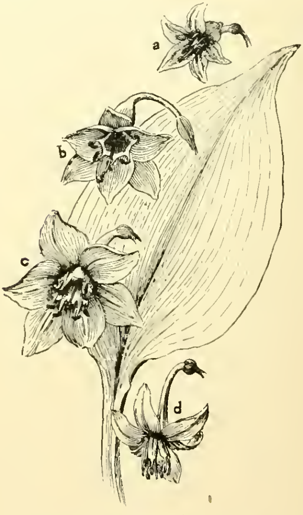
When grown in pots, they require a coarse, fibrous soil, composed chiefly of rotted sod, and enriched with about one-fourth of dry cow manure and a sprinkling of bone dust. The pots should be well drained, for much water is needed during the growing season, but frequent potting should be avoided, as the roots are impatient of disturbance. Shading from full sunshine is required, except during the winter months, and a night temperature of 65–70° is best for these plants. By drying off the Eucharis to some extent for a few weeks, a crop of flowers may be had at almost any season, providing the bulbs are strong and healthy, but they should never be dried to such a degree that all the foliage is lost, else the bulbs will be much weakened.

Good results are also had from planting out the Eucharis on a bench in a warmhouse, the soil and treatment being much the same as for pot-grown specimens. The only insects liable to give much trouble in connection with these plants are mealy bugs and thrips, and these may be controlled by thorough syringing.

W. H. TAPLIN.

A. *Cup toothed and protruded from the perianth-tube.*

grandiflòra, Planch. (*E. Amazónica*, Lind.). AMAZON LILY. STAR OF BETHLEHEM (a name also applied to Ornithogalum). Fig. 789. Bulb globular, 2 in. in diam.: lvs. 2–4 to each stem: scape 1–2½ ft., bearing an umbel of 2–4 large (4 in. across), very fragrant star-like fls. on pedicels nearly or quite 1 in. long; the segments oblong and obtuse; cup forming a distinct projecting tube. F.S. 9:957; 12:1216–17. B.M. 4971. Gn. 48, p. 217. G.C. III. 7:193; 16:665. A.F. 5:363; 8:445. F.E. 8:1000. F.R. 1:11; 2:364.



789. Eucharis.

Leaf of E. grandiflora, and fls. of (a) subedentata, (b) Sanderi, (c) grandiflora, (d) candida.

Var. **Moòrei**, Baker, may be expected to appear in the Amer. trade. It has smaller, rounder and thicker lvs. and smaller fls., with the cup lined with yellow.

Mástersii, Baker. Bulb often smaller: scape 1 ft. high, bearing 2 nearly sessile fls. in the umbel, the perianth segments ovate and spreading and shorter than in the last: cup forming a shallow frilled or notched collar. B.M. 6831. G.C. II. 24:721.—Possibly a hybrid of *E. grandiflora* and *E. Sanderi*.

AA. *Cup almost entirely joined or adnate to the perianth-tube (the winged filaments may project).*

cándida, Planch. Fig. 789, *d*. Bulb globose, bearing stolons, 2 in. in diam.: scape somewhat flattened, glaucous, 1–1½ ft. high, bearing 6–10 short-pedicelled fls.

in an umbel: segments oblong, acute, more or less reflexed: winged yellow filaments projecting, united at the base only. F.S. 8:788.—Smaller-fld. than *E. grandiflora*.

Sánderi, Baker. Fig. 789 *b*. Bulb ovoid, 1-2 in. in diam.: scape terete, 1 ft., bearing 2-3 nearly sessile white fls.: segments ovate, 1 in. or more long: yellowish cup, very narrow, like a collar or rim, and bearing the short, curved filaments on its edge. B.M. 6676. G.C. II. 19:349.—By some thought to be a hybrid of *E. grandiflora* and *E. candida*. Var. **multiflòra**, Baker. Fls. smaller, 4-6, striped green. B.M. 6831.

subedentàta, Benth. (*Calliphrùria subdentàta*, Baker). Fig. 789 *a*. Bulb ovoid, 1½ in. in diam.: scape slender, 1 ft.: fls. 6-8, on pedicels 1 in. or less long; tube 1 in. long, funnel-shaped above; segments oblong, ascending, 1 in. long; cup wanting, or represented only by obscure teeth on the filaments. I.H. 28:415. B.M. 6289.—A small-fld. species.

E. Bakeriàna, N. E. Br. Has the perianth of E. grandiflora and stamens of E. candida: fls. 2½ in. across, pure white: tube not enlarging emphatically at the top: cup projecting from the bases of the segments, not toothed. B.M. 7144. G.C. III. 7:417; 12:209.—*E. Elmetàna*, Sander. Hybrid of E. Sanderi and E. grandiflora. Easier to grow than E. Sanderi. G.C. III. 26:345.—*E. Lèhmanni*, Regel. Fls. about 4, 1½ in. across, the spreading corona with 12 long, narrow teeth, the perianth segments spreading or reflexed. Gt. 38:1300.—*E. Lòwii*, Baker. Robust: fls. 4 in. across, the spreading outer segments 1 in. wide and the 3 inner ones incurved. Perhaps a natural hybrid of E. grandiflora and E. Sanderi. G.C. III. 13:539; J.H. III. 28:111.—*E. Stèvensi*, N. E. Br. Free-flowering: very like E. Sanderi, and a garden hybrid of that species and E. candida. J.H. III. 30:253. Gn. 46:974. G.C. III. 17:365.

L. H. B.

EUCNÌDE (Greek-made word, referring to the sharp, nettle-like hairs). *Loasàceæ*. Three western American herbs, by some authors referred to Mentzelia. Fls. yellow; calyx-tube oblong, the limb persistent, 5-lobed; petals 5, united at the base and inserted on the throat of the calyx; stamens numerous, the filaments filiform: ovary 1-loculed, bearing a 5-cleft style. **E. bartonioìdes**, Zucc. (*Mentzèlia bartonioìdes*, Benth. and Hook.), is sometimes cult. It is a pretty summer-flowering annual, thriving in warm garden soil. Stems about 1 ft., more or less decumbent, hispid-hairy: lvs. alternate, petioled, broad-ovate and toothed-lobed: fls. large, on long pedicels, the petals ovate-pointed, the numerous yellow hair-like stamens projecting and brush-like. It is half succulent. Mex. and Tex. B.M. 4491, as *Microspérma bartonioìdes*, Walp.

L. H. B.

EUCODÒNIA is now referred to *Achimenes*.

EUCÒMIS (Greek, *beautiful hair*). *Liliàceæ*. Cape bulbs, half hardy, producing great radical rosettes of long leaves and a strong, leafy-topped spike of greenish flowers from the center. Fls. regular, 6-parted, rotate; stamens 6: ovary broad and short, obtusely 3-angled. Prop. by offsets. The bulbs may remain in the open if in a warm place and well protected. Will stand considerable frost. Of easy culture. Let the bulbs remain where planted. In the N. treated as glasshouse plants.

undulàta (*E. règia*, L'Her.). ROYAL CROWN. Lvs. long-oblong, spreading or recurving, undulate: scape 2 ft., bearing very numerous green or yellow-green fls. underneath a crown or canopy of lvs.: bulb ovate. B.M. 1083.

punctàta, L'Her. PINEAPPLE FLOWER. Lvs. erect-spreading, long and narrow, channeled, undulate, brown spotted beneath: scape 2 ft., spotted: fls. green, the ovary brown. B.M. 913. F.S. 22:2307. A form with lvs. striped beneath with brown is var. *striàta*, Sims. (B.M. 1539.)

bicolor, Baker. Stamens and margins of perianth segments bright purple, otherwise close to *E. punctata*, but lvs. unspotted (said to be a spotted var.). Foreign dealers offer var. *maculàta*.

L. H. B.

EUCRÝPHIA (Greek for *well covered*). *Rosàceæ*. Three or four southern hemisphere resinous trees or shrubs, with opposite, evergreen simple or pinnate lvs. and showy white fls. *E. pinnatifòlia*, Gay, is a shrub hardy in parts of England, with large white hypericum-like 4-petaled fls. and rose-like foliage. B.M. 7067. G.C II. 14:337; III. 9:613; 10:217; 15:109; 23:15 (fr.). *E cordifòlia*, Cav., has 5 petals and simple serrate lvs G.C. III. 22:247.—Neither of these is in the American trade. Worthy of trial in the South.

EUGÈNIA (named in honor of Prince Eugene of Savoy). *Myrtàceæ*. Trees or shrubs: lvs. evergreen, opposite, mostly finely penniveined: fls. white or creamy: fr. a drupe-like berry, usually globular and 1-seeded. Habit and inflorescence of Myrtus. For cult. and prop., see *Myrtus*. See *Myrtus*, also, for *E. Ugni*.

A. *Fls. solitary on axillary peduncles: petals free.*

Michelii, Lam. CAYENNE, or SURINAM CHERRY. PITANGA. Shrub, 20 ft.: lvs. ovate-lanceolate, glabrous: peduncles shorter than the glossy lvs.: berry cherry-like, ribbed, about 1 in. in diam., edible, with a delightful spicy, acid flavor. Ripe in May and June. Brazil. Hardy in southern Fla. and southern Calif. R.H. 1889, p. 532.—Much esteemed for jellies, and in great demand. Useful, also, as a pot-plant, freely producing its showy red fruits.

Brasiliénsis, Lam. GRUMICHAMA of Brazil. Shrub, 6 ft.: lvs. oval or obovate-oblong, bluntish, scale-like along the branches, 3 in. long, 1½ in. broad: fr. edible, scarlet, the size of a cherry. April. B.M. 4526. R.H. 1845:425.

AA. *Fls. in 3-forking panicles or cymes; petals free and spreading.*

myrtifòlia, Sims (*E. austràlis*, Wendl.). BRUSH CHERRY. Shrub, 6-12 ft.: lvs. petiolate, 2-3 in. long, obovate to nearly lanceolate, rather thick, dark and glossy green: peduncles 3-5-fld.: fr. edible, red or violet, about 8 lines in diam., crowned by the persistent calyx lobes. Austral. Hardy in the South. A.G. 11:756. B.M. 2230.—Chiefly grown for ornament. Used for hedges in Calif.

Jámbos, Linn. ROSE APPLE. JAMROSADE. JAMBOS. Tree, 20-30 ft.: lvs. narrow-lanceolate, acuminate, long, thick and shining, resembling those of an oleander: fr. 1½-2 in. thick, white or yellowish, with a tinge of blush-pink on one side, edible, rose-scented, apricot-flavored. E. Indies. Stove. B.M. 1696.—Valued for jelly-making.

AAA. *Fls. in 3-forking panicles or cymes; petals united into a calyptra.*

Jambolàna, Lam. JAMBOLAN, or JAMBOLAN PLUM. Tall shrub or tree: lvs. obtuse or shortly acuminate, 4-6 in. long, 2-3 in. broad: berry edible, varying from the size of a cherry to that of a pigeon's egg. E. Indies.

E. apiculàta, DC., Chile, has oval apiculate lvs. and 3-fld. axillary peduncles. Perhaps a Myrtus.

J. BURTT DAVY

EULÀLIA. Treated under *Miscanthus*.

EULARIA. Misprint for *Eulalia*.

EULÒPHIA (Greek, *handsome crest*). *Orchidàceæ*, tribe *Vàndeæ*. Terrestrial herbs with membranaceous lvs. and conspicuous pseudobulbs; scape basal, several-fld.: sepals and petals spreading, similar, ascending; labellum 3-lobed; pollinia 2.—The culture of Calanthe will apply to this genus.

maculàta, Reichb. f. Pseudobulbs ovate, compressed: lvs. ovate, spotted or blotched: fls. small; upper sepal hood-shaped, lateral ones acuminate, reddish brown; petals broader, white or pale rose; labellum cordate, with two crimson spots, triangular in outline, near the base, otherwise white. Braz. B.R. 8:618 (Angræcum).

scrípta, Lindl. Lvs. linear, subdistichous: fls. purple and yellow; sepals and petals linear-oblong; labellum 3-lobed, lateral lobes rotund at the apices. Madagascar.

OAKES AMES.

EULOPHIÈLLA (diminutive of *Eulophia*). *Orchidàceæ*, tribe *Vàndeæ*. Pseudobulbs fusiform, elongated: lvs. elliptic, plicate: raceme from the base of young growths, with violet rachis: fls. white, fleshy; labellum articulate with the base of the column. Two epiphytes, from Madagascar.

Elísabethæ, Lind. & Rolfe. Fls. 2–2½ in. across, usually 2–4 in the drooping cluster; sepals and petals ovate; labellum oscillatory; anterior lobe yellow. B.M. 7387. R.B. 21:181. I.H. 40:173.

Peetersiàna, Kränz. (*Grammatophyllum Ræmplerianum*, Reichb. f.). Lvs. 2–4 ft. long: scape 3–4 ft. long: fls. 3–4 in. across: sepals bright purple and blotched at tip; petals purple, unblotched; lip white, purple-bordered, with 4 erect crests. G.C. III. 23:200. Gn. 53, p. 379. (See G.C. III. 26:353). OAKES AMES.

EUÓNYMUS (ancient Greek name). Syn., *Evonymus*. *Celastràceæ*. SPINDLE TREE. BURNING BUSH. STRAWBERRY BUSH. Ornamental, deciduous or evergreen shrubs of upright or sometimes procumbent or creeping habit, with opposite, simple lvs. and rather inconspicuous greenish, whitish or purplish fls. in axillary cymes; very attractive in fall, with their handsome scarlet, pink or whitish, capsular frs., showing the bright orange seeds when opening, and with the splendid fall coloring which most of the species assume, especially *E. alatus*, *E. Hamiltonianus*, *Europæus* and *atropurpureus*. The Spindle Trees grow in almost any soil, and are well adapted for shrubberies. Most of the cultivated deciduous species, except those from Himalayas, are hardy North, while of the evergreen ones only *E. radicans* is fairly hardy, and, on account of its greater hardiness, is often used North as a substitute of the ivy for covering walls, rocks and trunks of trees, climbing, if planted in good soil, to a height of 15 and sometimes 20 ft. *E. Europæus*, and South the evergreen *E. Japonicus*, are sometimes used for hedges. Prop. by seeds, usually stratified and sown in spring, or by cuttings of ripened wood in fall. The evergreen species grow readily from cuttings of half-ripened wood under glass in fall or during the winter in the greenhouse. Varieties are sometimes grafted or budded on stock of their typical species. About 40 species are known in the northern hemisphere, extending also from S. Asia to Australia. Shrubs or small trees, with usually more or less quadrangular branches and opposite, usually glabrous and serrate lvs.: fls. small, in axillary cymes, 4–5-merous, generally perfect; style and stamens short, the latter inserted on a disk: fr. a 3–5-lobed, somewhat fleshy capsule, each dehiscent valve containing 1 or 2 seeds enclosed in a generally orange-colored aril; the seed itself is usually white. The wood is tough, close-grained and light-colored, often almost white, and used, especially in Europe, for the manufacture of small articles. The bark of the American species has medical properties.

INDEX.

alatus, 3.
albo-marginatus, 12.
Americanus, 1, 8.
angustifolius 1.
argenteo-marginatus, 13.
argenteo-variegatus, 12.
atropurpureus, 6, 8.
aureo-variegatus, 12.
aureus, 12.
Bungeanus, 11.
Carrieri, 13.
columnaris, 12.
Europæus, 6.
flavescens, 12.
gracilis, form of, 13.
Hamiltonianus, 9.
Japonicus, 12.
Koopmanni, 5.
latifolius, 7.
linifolius, 5.
Maackii, 9.
macrophyllus, 12.
medio-pictus, 12.
microphyllus, 12.
nanus, 5.
obovatus, 2.
pallens, 12.
pulchellus, 12.
pyramidalis, 12.
radicans, 13.
repens, 13.
reticulatus, 13.
robustus, 12.
roseo-marginatus, 13.
Sieboldianus, 9, 10.
subtriflorus, 3.
Thunbergianus, 3.
variegatus, 2.
verrucosus, 4.
viridi-variegatus, 12.
Yeddoensis, 10.

A. *Foliage deciduous.*

B. *Capsules tuberculate, depressed-globose. fls. 5-merous.*

1. **Americànus**, Linn. STRAWBERRY BUSH. Upright shrub, to 8 ft.: lvs. ovate-lanceolate or oblong-lanceolate, usually acute at the base, acuminate, crenately serrate, 1½–3 in. long: peduncle slender, few-fld.: fls. yellowish or reddish green: fr. pink. June. From southern N. York south, west to Tex. L.B.C. 14:1322. B.B. 2:394. —Var. **angustifòlius**, Wood (*E. angustifolius*, Pursh). Lvs. lanceolate or linear-lanceolate, half-evergreen South.

2. **obovàtus**, Nutt. (*E. Americànus*, var. *obovàtus*, Torr. & Gray). Procumbent shrub, with rooting stem and erect branches, to 1 ft.: lvs. obovate or elliptic-obovate, crenately serrate, light green, 1–2 in. long: fls. purplish: capsule usually 3-celled. May. From Canada to Indiana and Kentucky. G.F. 9:385.—It may be used for covering the ground under large trees, or for borders of shrubberies. Var. **variegàtus**, Hort., has the lvs. marked pale yellow.

BB. *Capsules smooth: fls. generally 4-merous.*

C. *Fr. divided to the base into 4 or less nearly separate pods.*

3. **alàtus**, Maxim. (*C. Thunbergiànus*, Blume). Spreading shrub, to 8 ft.: branches with 2–4 broad, corky wings: lvs. elliptic or obovate, acute at both ends, sharply serrate, 1–2 in. long: fls. 1–3, short-peduncled, yellowish: capsule purplish, small. May, June. China, Jap.—Var. **subtriflòrus**, Franch. & Sav. Branches not winged: fls. 1–5.

CC. *Fruit more or less 3–5-lobed.*

D. *Branches densely warty.*

4. **verrucòsus**, Scop. Erect shrub, to 6 ft.: lvs. ovate-lanceolate, crenately serrulate, acuminate, 1–2½ in. long: fls. slender-peduncled, 1–3, brownish: capsule deeply 4-lobed, yellowish red; seed black, not wholly covered by the orange aril. Southeastern Europe, W. Asia.

DD. *Branches smooth.*

E. *Anthers yellow.*

5. **nànus**, Bieb. Low shrub, to 2 ft., with slender, often arching or sometimes procumbent and rooting branches: lvs. linear or linear-oblong, mucronulate, entire or remotely denticulate and revolute at the margins, ½–1½ in. long: fls. slender-peduncled, purplish: capsule deeply 4-lobed, pink; seed brown, not wholly covered by the orange aril. May, June. W. Asia to W. China.—Handsome shrub for rockeries and rocky slopes, forming a graceful, pendulous, standard tree if grafted high on *E. Europæus*. Fruit ripens in August, earliest of all species. *E. Koòpmanni* is a form of this.

6. **Europæus**, Linn. Fig. 790. Erect shrub or sometimes small tree, to 20 ft.: lvs. ovate or oblong-lanceolate, acuminate, crenately serrate, 1½–2½ in. long: fls. yellowish, in few-fld. cymes: capsule 4-lobed, usually pink. May. Europe to E. Asia. B.B. 2:395.—Varying with narrower and broader lvs. There are also several varieties with variegated lvs. and some with frs. of different colors, as var. **frúctu atropurpùreo** with deep purple, **frúctu coccíneo** with scarlet, and **frúctu álbo** (var. *leucocarpa*, Hort.), with whitish frs. Var. **atropurpùreus**, Arb. Kew., has rather narrow purplish lvs.

790. Euonymus Europæus (× ⅓).

7. **latifòlius**, Scop. Shrub or small tree, to 20 ft.: winter buds slender, about ½ in. long: lvs. obovate-oblong, acuminate, crenately serrate, 2–4 in. long: fls. yellowish, often 5-merous, in slender-peduncled, rather many-fld. cymes: capsule pink, large, with winged lobes. S. Europe, W. Asia. B.M. 2384.—A very decorative species, with handsome foliage and large frs.

EE. *Anthers purple.*

F. *Fls. purple.*

8. **atropurpùreus**, Jacq. BURNING BUSH. Shrub or small tree, to 20 ft.: lvs. elliptic, acuminate, obtusely serrate, pubescent beneath, 1½–5 in. long: fls. purple, in slender-peduncled, many-fld. cymes: capsule deeply 3–4-lobed, scarlet. June. E. N. Amer., west to Montana. B.B. 2:394. *E. Americànus*, Hort.

FF. *Fls. yellowish or whitish.*

9. **Hamiltoniànus,** Wall. (*E. Maàckii*, Rupr.). Shrub, rarely small tree, to 30 ft., with almost terete branches: lvs. elliptic to ovate-lanceolate, acuminate, serrulate, 2–5 in. long: fls. in 3–12-fld. cymes: capsule deeply 4-lobed, with rounded valves, pink (yellowish in the Himalayan form); seed usually not wholly covered by the aril, grayish brown. June. Himalaya to Manchuria. Var. **semipersistens,** Rehder (*E. Sieboldiànus*, Hort., not Blume). Lvs. elliptic, long-acuminate, half evergreen, keeping its bright green foliage South until midwinter: fr. bright pink, ripening very late.

10. **Sieboldiànus,** Blume (*E. Yeddoénsis*, Hort.). Shrub or small tree, to 25 ft.: lvs. ovate-elliptic or elliptic, crenately serrate, shortly and abruptly acuminate, usually puberulous on the veins beneath when young: lvs. 3–6 in. long, 1–2½ in. broad: cymes 5–20-fld.: capsule pink, slightly lobed and 4-angled, with 4 narrow, thick wings; seed scarlet. June. Jap.—This species is often confounded with the former, but easily distinguished by its larger and much broader lvs.

11. **Bungeànus,** Maxim. Shrub, to 15 ft., with slender branches: lvs. slender-petioled, ovate-elliptic or elliptic-lanceolate, long-acuminate, finely serrate, 2–4 in. long: fls. in rather few-fld. but numerous cymes: fr. deeply 4-lobed and 4-angled, yellowish: seeds white or pinkish, with orange aril. June. China, Manchuria, M.D.G. 1899:569.—Very attractive with its rather large, profusely produced frs., remaining a long time on the branches.

AA. *Foliage evergreen.*

12. **Japónicus,** Linn. Upright shrub, to 8 ft., with smooth and slightly quadrangular or striped branches: lvs. obovate to narrow-elliptic, cuneate at the base, acute or obtuse, obtusely serrate, shining above, 1½–2½ in. long: fls. greenish white, 4-merous, in slender-peduncled, 5- to many-fld. cymes: capsule depressed, globose, smooth, pink. June, July. S. Jap.—A very variable species. Var. **macrophýllus,** Sieb. (var. *robustus*, Hort.). Lvs. oval, large, 2½–3 in. long. Var. **microphýllus,** Sieb. (*E. pulchéllus*, Hort. *Eurya microphýlla*, Hort.). Lvs. small, narrow-oblong or oblong-lanceolate. Var. **columnàris,** Carr. (var. *pyramidàlis*, Hort.). Of upright, columnar habit: lvs. broadly oval. There are many varieties with variegated lvs.; some of the best are the following: Var. **argénteo-variegàtus,** Rgl. Lvs. edged and marked white. Var. **aùreo-variegàtus,** Rgl. Lvs. blotched yellow. Var. **álbo-marginàtus,** Hort. Lvs. with white, rather narrow margins. Var. **mèdio-píctus,** Hort. Lvs. with a yellow blotch in the middle. Var. **pállens,** Carr. (var. *flavescens*, Hort.). Lvs. pale yellow when young; similar is var. **aùreus,** Hort., but the yellow is brighter and changes quicker to green. Var. **víridi-variegàtus,** Hort. (var. *Duc d'Anjou*, Hort.). Lvs. large, bright green, variegated with yellow and green in the middle.

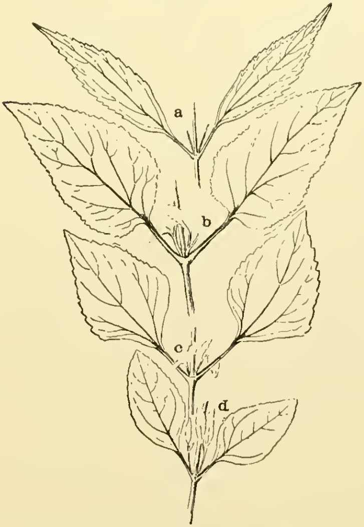
13. **radìcans,** Sieb. (*E. Japónicus*, var *radìcans*, Rgl.). Low, procumbent shrub, with often trailing and rooting or climbing branches, climbing sometimes to 20 ft. high: branches terete, densely and minutely warty: lvs. roundish to elliptic-oval, rounded or narrowed at the base, crenately serrate, usually dull green above, with whitish veins, ½–2 in. long: fl. and fr. similar to the former, but fr. generally of paler color. June, July. N. and M. Jap. R.H. 1885, p. 295. G.C. II. 20:793.—Closely allied to the former, and considered by most botanists as a variety; also very variable. Var. **Carrièri,** Vauv. Low shrub, with ascending and spreading branches: lvs. oblong-elliptic, about 1½ in. long, somewhat shining. Var. **argénteo-marginàtus,** Hort. Lvs. bordered white. Var. **ròseo-marginàtus,** Hort. Lvs. bordered pinkish. Var. **reticulàtus,** Rgl. (var. *píctus*, Hort., var. *argénteo-variegàtus*, Hort.). Lvs. marked white along the veins.

E. echinàtus, Wall. Usually creeping or climbing, with rooting branches: lvs. ovate-lanceolate: fr. spiny. Himal. B.M. 2767.—*E. fimbriàtus*, Hort., not Wall.=pendulus.—*E. grandiflòrus*, Wall. Shrub, to 12 ft.: lvs. obovate or obovate-oblong, finely and acutely serrate: fls. white, four-fifths of an in. across: fr. globose, yellow. Himal.—*E. occidentàlis*, Nutt. Shrub, to 15 ft.: winter buds rather large: lvs. ovate or elliptic-lanceolate, irregularly serrulate: fls. 5-merous, purple: fr. slightly lobed. Ore., Calif.—*E. oxyphýllus*, Miq. Shrub or small tree. lvs. ovate or obovate, acuminate, rather large, serrulate: fls. 5-merous, purple or whitish: fr. globose. Jap.—*E. péndulus*, Wall. (E. fimbriatus, Hort.). Evergreen, small tree, with pendulous branchlets: lvs. oblong-lanceolate, sharply serrate, shining, 3–6 in. long: fr. with 4 tapering wings. P.F.G. 2:55. F.S. 7, p. 71.

ALFRED REHDER.

EUPATÒRIUM (from an ancient personal name). *Compósitæ.* More than 400 species, mostly of warm or tropical countries, herbs or shrubs. Heads discoid (rayless), the florets 3 to many, perfect: involucre cylindrical, bell-shaped or hemispherical, the imbricated bracts in 2 or more series: receptacle flat or conical, naked: corolla regular, 5-toothed, slender-tubed: akenes 5-angled, truncate: pappus a single row of hair-like, scabrous bristles: perennials.

Gardeners know two classes of Eupatoriums, the glasshouse and the hardy kinds. The latter are native species which only lately have been introduced to the trade as border plants. The glasshouse species are seen only in the larger or amateur collections, as a rule, although some of them are old garden plants. They are confused as to kinds. These species demand the general treatment of Piqueria (or Stevia),—a cool or intermediate temperature and pot culture. They are easy to grow. Prop. readily by cuttings. They are useful for winter bloom. Of all Eupatoriums the individual heads are small, but they are aggregated into showy masses. For *E. cœlestinum*, see *Conoclinium.*



791. Leaves of glasshouse Eupatoriums (× ⅓).

a, *E. riparium;* b, *E. triste;* c, *E. glandulosum;* d, *E. glabratum.*

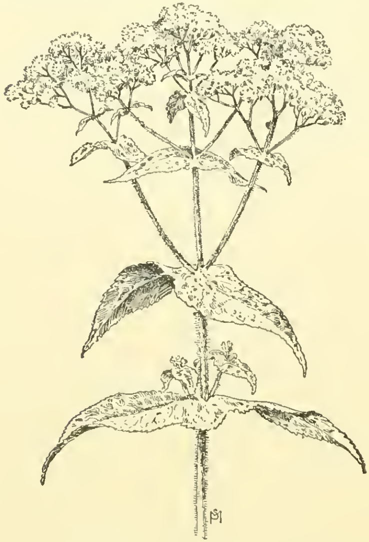
A. *Glasshouse or warm-country species.*

B. *Heads purplish.*

serrulàtum, DC. Shrubby: stems pubescent: lvs. opposite, very short-stalked, lanceolate or lance-oblong, the stalk ciliate, toothed and prominently nerved: heads aggregated into large purple or rosy tufts. Brazil and Uruguay. R.H. 1894:304. Gt. 44, p. 570. G.C. III. 18:265.—Choice.

atròrubens, Nicholson (*Hebeclínium atrórubens*, Lem.). Lvs. large, ovate-pointed, ciliate and hairy on the reddish veins, opposite, toothed: heads red or purple, aggregated into a very large red-rayed truss. Mex. I.H. 9:310.

iánthinum, Hemsl. (*Hebeclínium iánthinum*, Hook.). Sub-shrub, but soft-wooded, the terete branches rusty-pubescent: lvs. opposite, long-petioled, cuneate-ovate and serrate: fls. light purple, in a large, compound, terminal corymb. Mex. B.M. 4574.



792. Eupatorium perfoliatum (×⅓).

BB. *Heads white (plants valuable for cut-flowers).*

glechonophýllum, Less. (*Ageràtum conspícuum*, Hort.). Half shrubby: lvs. opposite, oval-pointed or ovate-lanceolate, nearly glabrous, 3-nerved, toothed, petiolate: fls. pure white, about 30 in each head. Chile.—Tender glasshouse perennial; but it may be flowered in the open the first year if seeds are sown early.

ripàrium, Regel. Fig. 791 *a*. Diffuse, becoming woody at base, 2 ft., the stems thin and usually reddish and puberulent: lvs. opposite, lanceolate-acuminate, narrowed into a long petiole, prominently 3-ribbed, dentate or crenate-dentate: heads in rather compact, long-stalked clusters. S. Amer.—Good winter bloomer. Best for the florist.

triste, DC. (*E. triéste*, Hort.). Fig. 791 *b*. Strong herb (sub-shrub in the wild), with hairy more or less angled or striate stems: lvs. long-petioled, ovate or oblong-ovate, hairy and rugose (reminding one of elm or nettle lvs.), very veiny, crenate-dentate: fls. many, bright white, in a large, terminal corymb. Mts. of Jamaica.—Now becoming popular as a pot subject and for cut-flowers.

glandulòsum, HBK. (*E. adenóphorum*, Spreng. *E. adenánthum*, Hort., not DC. *E. Americànum*, Hort.). Fig. 791 *c*. Diffuse, at length somewhat decumbent at base, the branches glandular-hairy: lvs. deltoid- or cuneate-ovate, slender-petioled, coarsely and sometimes unevenly crenate-dentate, sparsely pubescent below: heads pure white, ageratum-like, in close clusters. Mex.

glabràtum, HBK. (*E élegans*, Hort. *E. latifòlium*, Hort.). Fig. 791 *d*. Shrubby, erect, with thin, hard, glabrous brown stems: lvs. thickish, small, lance-oblong or ovate-oblong, tapering into a strong petiole, blunt-acute, undulate or small-toothed: fls. (sometimes blush) in ascending clusters, which combine to form a strong, terminal panicle. Mex.

AA. *Hardy or border plants.*

B. *Heads purple.*

purpùreum, Linn. JOE-PYE WEED. Tall, rank plant of low grounds (reaches 8–9 ft.): lvs. whorled, oblong or lanceolate, acuminate, coarsely serrate and veiny: heads in large, compound clusters, purple to flesh-color (rarely almost white). Var. **maculàtum,** Darl. (*E. maculàtum*, Linn.), is mostly lower and roughish pubescent, the stem purple-marked. Var. **amœnum,** Gray. Still lower, (2 ft. high), nearly glabrous, the lvs. often opposite.—A good species for bold effects in a border or against shrubbery. Common, and widely distributed.

BB. *Heads white.*

C. *Lvs. perfoliate (united around the stem).*

perfoliàtum, Linn. BONESET. THOROUGHWORT. Fig. 792. Stout, rank-smelling, pubescent, 3–5 ft.: lvs. lanceolate, rugose and pubescent, finely toothed: heads in dense white cymes.—Common in low ground. Much used in domestic medicine. Excellent for striking effects, particularly in low grounds.

CC. *Lvs. not perfoliate.*

altissimum, Linn. Tall (reaches 7–8 ft.), densely pubescent, branchy: lvs. opposite, lanceolate-acuminate, the petiole very short, remotely dentate or entire: heads only 5-fld. Open places, Pa. southward.

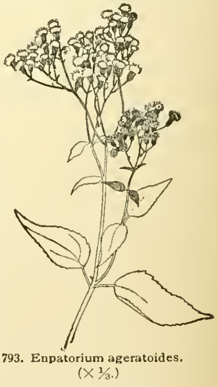
álbum, Linn. One–3 ft., pubescent: lvs. opposite, nearly or quite sessile, oblong or lance-oblong, coarsely serrate. Sandy soil, E. states.

ageratoìdes, Linn. f. WHITE SNAKEROOT. Fig. 793. Neat, glabrous, branchy herb, 3–4 ft.: lvs. opposite, thin, ovate with broad base, acuminate, coarsely and sharply toothed: heads small, in a loose but ample inflorescence. Rich woods, Can. to La.

aromáticum, Linn. Resembles the last, but usually pubescent: lvs. thickish and blunt or merely acute, the teeth blunt, later-flowering. Dry soil, E. states.

Var. **melissoìdes,** Gray (*E. Fràseri* and *E. cordifòlium*, Hort.). Slender and roughish, strict: heads 5–12-fld.: lvs. subcordate-ovate or oblong, obtuse, crenulate-dentate, sometimes with coarser teeth, the petioles very short. S. E. states.

Various species of the old genus *Hebeclinium* may be expected in amateur collections, especially *E. macrophýllum*, Linn. (H. macrophyllum, DC.), with very large subcordate-toothed lvs., purple heads and purple-hairy stems. R.H. 1866: 350. Other glasshouse species are: *E. grandiflòrum*, André, with rugose cordate coarse-toothed lvs. and reddish heads (R. H. 1882:384); *E. Haageànum*, Regel & Kœrn., with oval-acuminate coarse-toothed lvs. and small, white heads; *E. micránthum*, Less., from Mex. (known in cult. as E. Weinmannianum, Regel & Kœrn.), with elliptic-lanceolate lvs. and large, fragrant white heads (Gn. 47, p. 444, G.C. II. 5:53); *E. pròbum*, N.E. Br., with oval, velvety lvs., white heads, and whole plant glandular-sticky (G.C. III. 7:321). L. H. B.



793. Eupatorium ageratoides. (×⅓.)

EUPHÓRBIA (classical name, said by Pliny to be in honor of King Juba's physician; possibly from the Greek word for fat). *Euphorbiàceæ.* SPURGE is a name sometimes applied to the genus as a whole, but is, perhaps, better restricted to one or more species. One of the largest plant genera, of perhaps a thousand species, not less than 700, of very diverse habit, and found in most temperate and tropical regions. Many are desert plants, and the greater number grow in dry and sterile places.

Herbs, shrubs or trees, often fleshy and cactus-like, or low and prostrate weeds; but all characterized by a single pedicellate-pistillate flower, with a 3-celled, 3-seeded ovary, without floral envelopes or with a minute calyx, surrounded by numerous staminate flowers consisting each of a single stamen, the insertion of which is represented by an articulation with the pedicel, the whole surrounded by a more or less cup-shaped involucre, with 5 lobes, and bearing 1-5 glands of various shapes between the lobes. The staminate flowers are usually subtended by minute bracts. The glands often bear petal-like appendages, the whole involucre (or cyathium) closely simulating a perfect flower (Fig. 794).

Most of the species have abundant milky juice, and the cactiform species have been thus distinguished from cacti, but many cacti also have milky juice. The juice of most species is acrid poisonous, especially if it comes in contact with mucous membranes or open sores. The juice from some of the species is used in medicine as a purgative.

Monographed by Boissier in DeCandolle's Prodromus, 15, pt. 2 (1862). See local floras and Norton, Rept. Mo. Bot. Gard. 11, for native species. Works like Nicholson's Gard. Dict. and Bois' Dict. d'Hort. describe a number of cultivated species. See also Fobe, in Monatsschrift für Kakteenkunde, 8:42 (1898).

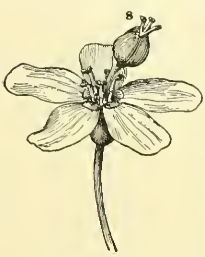
Many of the fleshy species are cultivated by lovers of succulents for their curious shapes; and a few are valuable for their ornamental foliage. The flowers are usually too minute to be noticeable. Some, like *E. corollata* (Fig. 794), *E. maculata, E. Cyparissias and E. marginata*, are weeds in America, but not troublesome. The great majority of the species are insignificant herbs. The species are remarkably free from injurious insects, and are rarely attacked by a few fungi.

The fleshy species are grown much the same as cacti (which see), but the culture is less difficult, and they do well with warmer treatment. In winter they are kept in a dry and cool house, 50° to 55° F., with good light and little water. Drips must be carefully avoided. In summer the pots should be plunged outdoors in hot, dry situations, with a moderate supply of water and especially good drainage. It is better to protect them from continued rain, but most species do well without this. The more fleshy species, like *E. Caput-Medusæ* and *E. meloformis*, require more heat and better care than the others. They are propagated by cuttings. Grafting has not been practiced to a great extent, as with cacti, but seems possible. They do not require a rich soil, and do well in a coarse, sandy loam, or some say in any kind of soil.

The shrubby species, like *E. atropurpurea* and *E. dendroides*, do well with the treatment of the more fleshy kinds. See D. A. W. and F. S. Curtis, in Sharon Cactus Guide, Mar. and May, 1897.

The few hardy species of ornamental value make good border plants or are suitable for the rockery. They are mostly propagated by division. The annuals are easily grown from seeds.

E. pulcherrima and *E. fulgens* are good winter-flowering greenhouse plants, and require special treatment. *E. fulgens* succeeds well in the warmest parts of the house, in pots, or best planted out like roses and trained upon the wall or strings. It is propagated from cuttings taken in June, when the old plants have started to grow, kept in a warm frame until rooted, and then kept growing with heat, any transfers being made with as little root disturbance as possible. If stocky show plants are wanted, several cuttings may be planted in one pot and checked two or three times during summer by repotting, and kept pinched back freely to secure branches. They are best kept cooler when in flower, but are very sensitive to cold or sudden changes in temperature. After flowering they are kept dry for a few months. For the cut sprays they are best grown from cuttings each year. They last very well when cut. The culture of the Poinsettia is very similar. To secure plants with large heads, the general plan is to grow from cuttings annually, but the old plants may be continued. Old plants that have been resting may be introduced to heat and moisture in late spring, and will soon give a liberal supply of cuttings, which are usually taken from the young wood. Successive sets of cuttings may be made at later periods if different sized plants are wanted. When well started, the potted plants are plunged outdoors till September, with plenty of water, light and sunshine and good drainage. They do well in rich, heavy loam in 5-7-in. pots. They are apt to drop their leaves if exposed to cold or other unfavorable conditions. In autumn they are transferred to the greenhouse, with moderate temperature. When the bracts begin to appear, give more heat and some manure water to expand them. When in flower, reduce the temperature to preserve them longer. After flowering the pots may be stowed away in a dry, warm place till spring,—under the benches will do. When the buds are cut the great objection is that they wilt easily. This may be obviated by dipping the cut ends in boiling water, or keeping them in water for a few days before using. See Grieve. G.C. III. 9:106, and Hatfield in Gard. and Forest 9:496.



794. Flowers of Euphorbia corollata (× 2).
The pistillate flower is at 8.

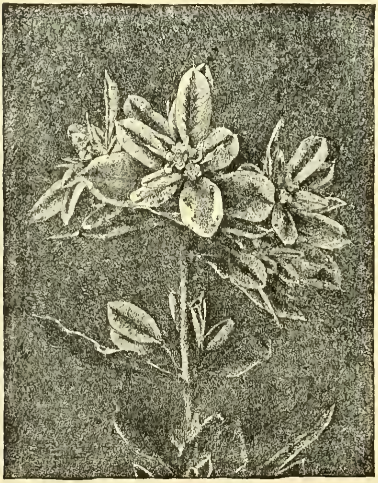
E. splendens is another winter bloomer, and may be treated as the succulents, with more heat and water. It will do well in living rooms, and bears some flowers all the year. It bears rough treatment well, and is propagated by cuttings from the young growth, which root with the greatest ease.

J. B. S. NORTON.

CULTURE OF POINSETTIA.—*Euphorbia pulcherrima* and varieties are fine shrubs, evergreen or deciduous, according to the climates in which they are grown. They are found at considerable elevations in Mexico, and subtropical conditions encourage their highest development. The original plants were introduced by a Dr. Poinsett, of Charleston, S. C., who sold them to the late Robert Buist, about 1833. Buist was a famous Scotch nurseryman of Philadelphia, who, during the early seventies, also distributed the so-called double variety. He sent both forms to Europe, and never quite forgave the botanists for changing the name which he gave the plant—*Euphorbia Poinsettiana*.

Under natural conditions Poinsettias form large bushes from 5-10 feet high and 12 or 14 feet in diameter, with woody bases and hollow annual growths. Flowers small, yellow, surrounded by an involucral crown of intense crimson leaves, the whole as large as a sombrero when well developed, varying to the smaller growing variety with creamy white bracts. Their highest development has been noted at Kotergherry, on the Nilgiri mountains of South India, at an elevation of about 6,000 feet, with a rainfall of 50 inches. The minimum temperature varies from 51° F. in January to 60° in July and August, the maximum from 66° F. in January, gradually increasing to 70° in July and August. In parts of the Mediterranean basin, in southern California and similar climates, and in many parts of the tropics at the sea level, the plants are grown, but do not reach such great perfection, for they become deciduous and often stunted. The period of flowering in the northern hemisphere is from late November to March.

There are several ways of managing the plants in cultivation. They are propagated by single eyes, by 4- or 5-inch cuttings of the one-year-old wood, or by young shoots with a heel of hard wood about March, or by the green tops about the end of August. If they are intended for pot culture as large plants, they simply require shifting along to 8- or 10-inch pots, with good drainage and good, turfy soil, with rather more sand than is commonly used for roses. After these large plants have bloomed, they may be stowed away to rest in a dry, light shed with a temperature of not less than 50°. Do not water them, and before the buds wake up in spring, shake them out, prune them to an eye or two, cut out the dead parts, repot them, and presently they will start to grow again. They may be gradually hardened, plunged outdoors and grown in the full sun during summer, giving them a shift during growth if extra luxuriance is desired. If bench culture is desirable, plants may be turned into the ground from 4-inch pots, or even from the propagating bed, grown until the end of August or later southward, the leaves stripped from all the stems but the upper foot or so, lifted, and laid flat on the benches, with a bushel or so of good soil over the roots and about an inch over the benches in the spaces. The next rank of plants may have their tops laid well over the roots of the first, and so proceed until all are planted. The ends soon turn up as growth starts, and the heads are very large and fine with suitable temperature and attention. Sometimes mealy bug gets into the heads. It may be driven out by a moderate stream of water from a hose, supporting the heads with one hand to avoid breaking. They are quite brittle. The milkiness produced by cutting may be got rid of by standing the stems in water, for it is sticky, stains, and is disagreeable. For small pot-plants the green tops, about 6 or 8 inches long, may be taken in August, dibbled into well drained 4-in. pots, set on mild bottom heat, or placed in a rather humid equable temperature southward. They must not be over-watered or too densely shaded, when they will soon strike, form handsome little plants, often with leaves to the pots, and be very useful for many purposes. For detailed points by professional growers, see A.F. 11:285, 457; 12:536.



795. Euphorbia marginata (× ⅓).

James MacPherson.

The following is an alphabetical list of the names in the American trade :

Abyssinica, 20.
alcicornis, 16.
antiquorum, 12.
arborea, 32.
atropurpurea, 29.
Beaumeriana, 23.
cærulescens, 19.
Canariensis, 18.
candelabrum, 22.
Caput-Medusæ, 24.
cereiformis, 26.
corollata, 2.
Cyparissias, 35.
dendroides, 31.
drupifera, 10.
echinus, 23.
erosa, 26.
fulgens, 3.
grandicornis, 13.
grandidens, 16.
grandifolia, 10.
Grantii, 32.
Havanensis, 12.
hæmatodes, 29.
heptagona, 26.
Hermentiana, 14.
heterophylla, 5.
Hystrix, 27.
jacquiniæflora, 3.
lactea, 12, 15.
Lathyris, 28.
mamillosa, 11.
marginata, 1.
meloformis, 25.
Mexicana ?
Myrsinites, 37.
Natalensis, 36.
neriifolia, 9.
Palmeri, 34.
pandurata, 5.
pendula, 6.
Pfersdorffii, 21.
Poinsettia, 4.
polygona, 26.
pulcherrima, 4.
Regis-Jubæ, 30.
rhipsaloides, 7.
robusta, 34.
sanguinea, 29.
splendens, 8.
Tirucalli, 7.
triangularis, 17.
variegata, 1.
virosa, 19.

A. *Involucres flower-like, with 4 or 5 petaloid appendages*

1. **marginàta**, Pursh (*E. variegàta*, Sims). Snow-on-the-Mountain. Fig. 795. Plant 2 ft. high, pubescent, dichotomously many-branched : lvs. numerous, with stipules, light green, 1–3 in. long, ovate-subcordate to oblong-lanceolate, the upper ones margined, with white or some entirely white ; involucres in the forks of the branches, their appendages large, white. July–Oct. Plains from Dakota to Texas and extending eastward. B.M. 1747. Gt. 30:218.—Hardy annual, used for its white foliage in bedding and mixed borders in sunny situations.

2. **corollàta**, Linn. Flowering Spurge. Fig. 794. Plant 1½–3 ft. high, usually glabrous, slender and diffusely branched above: lvs. without stipules, ovate-oblong to lanceolate, 1–2 in. long, those of the inflorescence much smaller and opposite ; appendages of the numerous involucres 5, white, conspicuous for the genus. July–Oct. Rather dry soil in east U. S. B.M. 2992. L.B.C. 4:390. F.R. 1:969.—A hardy herbaceous perennial, used like Gypsophila for cutting and as a bedder in light soil. Very variable in size and shape of plant, leaves and inflorescence.

3. **fúlgens**, Karwinsky (*E. jacquiniæflora*, Hook.). Scarlet Plume. Fig. 796. Small shrub, with slender, drooping branches: lvs. long-petioled, lanceolate, bright green ; involucres in small axillary cymes, their 5 conspicuous bracts bright orange-scarlet. Mexico. B.M. 3673. G.C. II. 19:816.—A handsome winter-blooming plant, used for cut-flowers or for specimen plants.

AA. *Involucres without petaloid appendages to their glands, but the glands or subtending bracts sometimes colored petal-like.*

B. *Stem herbaceous or shrubby, not fleshy: upper leaves colored : stipules glanduliform : inflorescence cymose.*

4. **pulchérrima**, Willd. (*E. Poinsettiàna*, Buist. *Poinsettia pulchérrima*, Grah.). Poinsettia. Fig. 797. A shrub, 2–6 ft. high, branched : lvs. ovate-elliptical to lanceolate, entire, sinuate-toothed or lobed, or panduriform, 4–6 in. long, somewhat pubescent, becoming narrower, more entire and of the brightest vermilion-red above ; involucres greenish, with one large yellow gland. Nov.–Feb. Moist, shaded parts of tropical Mexico and Central America. B.M. 3493. G.C. III. 21:125, 193.—Sometimes cut, usually used for specimen plants and in masses. A gorgeous plant. Varieties with white and yellow bracts occur. Var. **plenissima**, Hort., has a double series of bracts and forms a wider and higher head. G.C. III. 5:17.

5. **heterophýlla**, Linn. (*E. panduràta*, Hort.?). Mexican Fire Plant. Hypocrite Plant. Painted Leaf. Fire-on-the-Mountain. Annual Poinsettia. Annual, nearly glabrous, 2–3 ft. high : lvs. ovate and sinuate-toothed or fiddle-shaped, or some of them linear or lanceolate and entire, dark green, the upper bright red at the base or only the tips green, involucral glands 1 or 2. July–Sept. Eastern and central U. S. to Peru. Mn. 2, p. 53. Gt. 39, p. 105.—Easily grown in sunny places and also in pots indoors. White and yellow variegated forms are in cultivation in this country.

BB. *Stem more or less fleshy or spiny, often cactus-like: leaves small, none or soon deciduous; involucres single or few together.*

C. *Branches short cylindrical, smooth, quill- or rush-like, slender.*

6. **péndula**, Boiss. Branchlets many, slender, pendulous: lvs. very small, opposite. S. Africa ?

7. **Tirucálli**, Linn. (*E. rhipsaloìdes*, Lem.). A tree, 20 ft. high, with many slender subverticillate ascending branches ; twigs 4–8 in. long : lvs. 5–8 lines long, few, alternate. E. Africa and India.—A striking plant.

cc. *Branches fleshy, a spine on each side of every leaf or leaf-scar, in a few the leaf transformed into a third thorn between them.*

D. *Podaria (the projections bearing leaves and spines) distinct: branches cylindrical or obsoletely angled.*

8. **spléndens**, Bojer. Crown of Thorns. Fig. 798. Stems 3–4 ft. long, ½–1 in. thick, covered with stout spines almost an inch long, somewhat twining: branches few: lvs. few, on the young growth, obovate to oblong-spatulate, thin, bright green, 1–2 in. long; involucres in long-peduncled dichotomous cymes, near the ends of the branches, each closely subtended by two broadly ovate bright red bracts, filaments forked. Madagascar, flowering all the year, but mostly in winter. B.M. 2902. L.B.C. 18:1713.—Coolhouse plant. The red bracts, with green leaves on the sinuous spiny stems, are striking. It can be trained into ornamental forms.

9. **neriifòlia**, Linn. Arborescent or shrubby: stem obtusely 5-angled, 3–7 ft. or more high: the small mammiform podaria in rows, with short, dark colored, divergent spines: branches numerous, bearing obovate-oblong, obtuse, thick lvs., 3–5 in. long at the summit: small, sessile cymes of greenish involucres in the upper axils. June, July. E. Indies.—Large lvs. persistent from autumn to spring. Cristate forms are in cult.

10. **drupífera**, Schum. & Thorn. (*E. grandifòlia*, Haw.). Arborescent: stem terete: branches obsoletely 4–5-angled; spines small: lvs. terminal, obovate-cuneate, obtuse or retuse, 5–8 in. long: small cymes axillary, peduncled: capsule drupaceous. Guinea.

796. Euphorbia fulgens (× ⅓).

11. **mamillòsa**, Lem. Low, cespitose: branches less than an inch in diam.: podaria elongated, conical, in 5 spiral rows: lvs. and spines small, soon deciduous.

DD. *Podaria confluent into ribs: branches more or less acutely wing-angled.*

E. *Growths or branches 3-angled (sometimes 4-angled, especially on the main axis, and in E. alcicornis flat).*

12. **antiquòrum**, Linn. (*E. Havanénsis*, Hort.? *E. láctea*, Hort.?). Shrub, 8–10 ft. high: branches erect-spreading, jointed; angles compressed, repand dentate, the teeth 1 in. long; spines 1–3 lines long: lvs. minute, ovate-spatulate or rotund. India, and naturalized in other places, notably the W. Indies, where it is used for hedges.—Cristate forms are in the trade, as *E. lactea monstrosa?* and *E. Havanensis cristata*.

13. **grandicòrnis**, Gœbel. Fruticose: branches 3 in. wide; angles broadly winged, deeply lobed and sinuate; spines large, 1–2 in. long, light colored. S. Afr. Neubert's Deutsche Garten Mag. 46:201.—A striking plant, with the widest wings and longest spines of all.

14. **Hermentiàna**, Lem. A shrub, 3–4 ft. high, with many non-jointed, erect branches, their edges repand-dentate and broad, slightly concave faces, white-marbled when young; spines 2–2½ lines long: lvs. lanceolate or lance-spatulate, 3–5 in. long. Gabon river, W. Afr.—Considered one of the best.

797. Euphorbia pulcherrima (× 1-5).

15. **láctea**, Haw. A shrub: branches erect; faces 1–3 in. wide, plano-convex, yellow and green striped; edges subcompressed, repand dentate; spines 2–3 lines long. East Indies.

16. **grándidens**, Haw. Tree, 20–30 ft. high and as much as 3 ft. in diam.: branches slender, ½–¾ in. wide, numerous, erect-spreading, making a rounded head in old plants; faces almost plane; angles deeply lobed-dentate; spines 3–5 lines long, slender: lvs. very small, triangular. S. Afr. G.C. II. 26:721.—**E. alcicornis**, Hort., is probably a form of this with flat branches.

17. **trianguláris**, Hort. Par. Stem 3–7 ft. high, triangular: numerous branches erect, with convex faces dark green; the winged angles sharply toothed and short-spined. S. Afr.

EE. *Growths or branches with 4 or more angles or rarely 3-angled.*

18. **Canariénsis**, Linn. Shrub or tree, 12–20 ft. high, with many 4–6-angled suberect branches, as much as 3 in. thick, from the base; angles subentire; spines 2 lines long, black: lvs. almost none. Canary Islands. Gn. 53, p. 46. G.C. II. 20:629.

19. **viròsa**, Willd. (*E. cœrulés-cens*, Haw.). A shrub as much as 15 ft. high, much branched: branches 4–5- or sometimes 3-angled, 1 in. thick, ascending; angles lobed; epidermis bluish; spines strong, 4–5 lines long, black. S. Afr.

20. **Abyssínica**, Ransch. Stem robust, 30–40 ft. high, 9–14 ft. in greenhouses: branches few, 4–6 in. in diam., dark green; angles 5–8, obtuse but prominent; edges undulate; spines short, recurved: lvs. minute, spatulate. Abyssinia. Gn. 52, p. 106. G. C. III. 20:497.—Much resembles *Cereus Peruvianus*.

21. **Pférsdorffii**, Hort. Trunk round, 1½–2½ in. thick, 9-ribbed, much branched when old; spines large, 4–8 lines long.

798. Euphorbia splendens (× ⅓).

22. **candelàbrum**, Trem. & Klotzch. Tree, 20–30 ft. high, with a head 60–80 ft. in circumference: trunk short and thick, densely branched: branches 3–4-angled;

spines short. Trop. Afr.—See *E. Tirucalli* for some plants sold under this name.

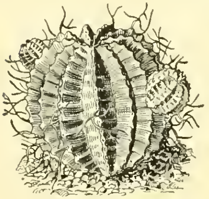
23. **officinàrum**, Linn. Fruticose: branches 2½–3 in. thick, 9–13-angled, deeply sulcate; edges repand; spines red, divergent or deflexed, 1–1½ lines long: lvs. minute. N. Afr. R.H. 1875:336–37.—**E. Beaumeriana**, Hook. & Coss., and **E. echinus**, Hook. & Coss., are closely related species from the same region.

ccc. *Branches with spines, if any, not stipular, but in the place of lvs. or branches*

D. *Spines not present.*

24. **Càput-Medùsæ**, Linn. Medusa's Head. Stem short, obconical, fleshy: branches numerous from the apex, soon declined around the main stem with their ends erect, ½ in. or more in diam., 6–12 in. long, covered with depressed, keeled tubercles, each bearing a small. linear-lanceolate leaf; glands of the involucre white, rather conspicuous, the outer lip palmatifid. S. Afr. L.B.C. 14:1315.—Curious and rather rare. Var. **màjor**, Ait. (*E. Commelini*, DC.), is a large, erect, unbranched form, perhaps originating from branch cuttings.

25. **melofórmis**, Ait. Fig. 799. Globose or pyriform, 3–5 in. in diam., deeply 8–10-costate, the ribs obscurely tuberculate on the almost acute angles, the sides transversely dark and light green striped or wrinkled when old: the few small lvs. and fls. at the depressed apex: the old forked branches of the inflorescence subpersistent but not spinose. A few small branches similar to the main stem usually present. S. Afr. L.B.C. 5:436. A.G. 11:463.—A very interesting and rare plant in Amer. Best grown only under glass. Often mistaken for a cactus.



799. Euphorbia meloformis.

DD. *Spines formed of the sterile peduncles.*

26. **cereifórmis**, Linn. (*E. eròsa*, Willd.). Erect, 3 ft. or more high, little branched: branches erect, with 8–13 tuberculate ribs: lvs. very small: peduncles usually with only one involucre, the sterile ones forming dark colored spines 4–7 lines long. S. Afr. L.B.C. 14:1334.—**E. polýgona**, Haw., with more prominent and spiral ribs, and **E. heptágona**, Linn., with 7–8 ribs and sulci between them more obtuse, are closely related South African species.

27. **Hýstrix**, Jacq. A shrub, 2–3 ft. high, not ribbed: podaria depressed: lvs. 2–3 in. long, linear; spines numerous, 1–2 in. long, erect-spreading. S. Afr. Jacq. Hort. Schœnb. 207.

BBB. *Stems herbaceous or woody, scarcely ever slightly fleshy-stemmed: inflorescence umbellate: stipules none.*

C. *Lvs. below the umbel decussate: tall herbs.*

28. **Láthyris**, Linn. Caper Spurge. Mole Plant. Fig. 800. Annual, 2–3 ft. tall: lvs. long, lance-linear, those of the inflorescence ovate-acuminate; glands short-horned: capsules somewhat fleshy. Eu., and naturalized in eastern U.S. Rept. Mo. Bot. Gard. 11, pl. 11.—Cult. in old gardens. Capsules sometimes pickled. Seeds used as a purgative. Said to drive moles from its neighborhood (see Cornell Bull. 61:331).

cc. *Lvs. usually clustered at the ends of the branches: shrubs.*

29. **atropurpùrea**, Brouss. A shrub, 3–6 ft. high, branched: the pale, glaucous green, spreading or drooping lvs. crowded at the ends of the branches, 2–3 in. long: umbel 5–10-rayed; involucres surrounded by 2 large, dark purple, broadly ovate, obtuse, connate bracts. March. Teneriffe. B.M. 3321.—Plants known as *E. atropurpurea* and *E. sanguinea* in America, and used for bedding, are in part *E. hæmatodes*, Boiss., a species of Section A not well known to botanists, and partly a purplish var. of *E. pulcherrima*.

30. **Règis-Jùbæ**, Webb. Like the last, but lvs. narrowly linear and bracts not dark purple; involucral gland with 2 short horns. Teneriffe.

31. **dendroìdes**, Linn. A large, branching shrub, more foliaceous than the two preceding: leaves linear-lanceolate, obtuse or acute; floral leaves yellowish, rhomboid-orbicular, mucronate, glands truncate or semi-lunate. Mediterranean region. R.H. 1887:160. Gn. 36, p. 203.

32. **Grántii**, Oliv. Small shrub with lanceolate leaves, large, long acuminate, ovate bracts and palmate glands. E. Africa. This and the **E. arborea** offered by Blanc probably belong in this section, though the *E. Grantii* of American dealers may possibly be *Synadenium Grantii*, Hook.

ccc. *Lvs. below the umbel alternate; glands oval in the first species, in the others two horned: leafy herbs.*

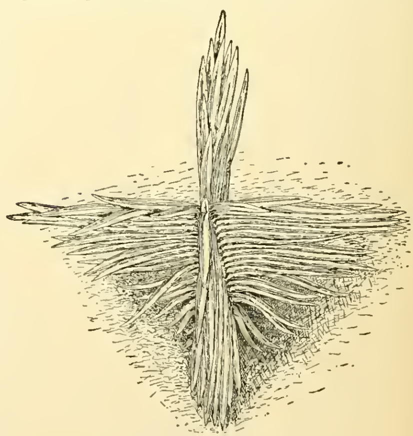
33. **epithymoìdes**, Jacq. (*E. polychròma*, Kern.). A herbaceous perennial, a foot or more high, with oblong, dark green leaves, floral leaves different shades of yellow at flowering time. May. Europe. B.M. 2258.—Growing in a fine, compact clump, uncommon in gardens.

34. **robústa**, Small, and **Pálmeri**, Engelm., are many-stemmed perennials, the former from the Rocky mountains, the latter from S. Calif., a foot high, more or less, with small ovate leaves and roughened seeds. They have been offered for sale, but have little cultural value.

35. **Cyparíssias**, Linn. Herb, perennial from root buds, the short plume-like branches covered with spreading, narrow linear, dark green leaves an inch long: seeds smooth. Europe. L.B.C. 2:118. G.C. II. 22:469. Rept. Mo. Bot. Gard. 11, pl. 50.—Cult. in old gardens for its moss-like growth. Naturalized and a weed in east U.S.

36. **Natalénsis**, Bernh. Stems many, ½–1 ft. high: umbel 3–5-rayed, head-like: leaves crowded, narrow linear-lanceolate, subcoriaceous. S. Africa.

37. **Myrsinìtes**, Linn. Perennial herb: many declined stems covered with large, fleshy, glaucous, obovate or ovate-oblong, concave, pointed leaves: umbel 7–12-rayed: glands and flowers yellow. Europe.—A plant of old gardens, good for rockeries.



800. Euphorbia Lathyris.
Seen endwise to show 4-ranked leaves.

Plants in cult. in Europe but not in the American trade:

Fleshy forms: *E. anacántha*, Ait.—*E. bupleurifòlia*, Jacq. Short, thick, scaly stem, with a cluster of large leaves at the top.—*E. Bòjeri*, Hook. Near E. splendens.—*E. Breòni*=E. Bojeri. —*E. Capénsis*, Hort.—*E. clandéstina*, Jacq.—*E. enneágona*, Haw.=cereiformis, Linn.—*E. fimbriàta*, Hort.?—*E. Fournièri*, Rebut, a Madagascar species near E. lophogona, Lam.—*E. globòsa*, Sims. B.M. 2624.—*E. glomeràta*, Hort.—*E. helicothèle*, Lem.=E. Nivulia, Buch.—*E. imbricàta*, Vahl.—*E. Lemaireàna*, Boiss. Like E. grandicornis, but spines much shorter.—*E. lophógona*, Lam. Peculiar club-shaped stem, with large leaves above and cristate stipules. Madagascar.—*E. macroglýpha*, Lem.—*E. mamillàris*, Linn.—*E. Montieri*, Hort.—*E. pentágona*, Haw.—*E. piscatòria*, Ait.—*E. pyrifòlia*, Lam., near lophogona.—*E. serpifórmis*, Boiss.=E. scopiformis.—*E. squarròsa*, Haw.—*E. stapeliæfórmis*, Hort.—*E. tetrágona*, Haw.—*E. tithymaloìdes*, Linn.=Pedilanthus tithymaloides.—*E. trígona*, Haw.—*E. tuberculàta*, Jacq.—*E. xylophylloìdes*, Brongn.

Shrubby or tree-like forms: *E. balsamífera*, Ait.—*E. Berthelòti*, Bolle.—*E. calletioìdes*, Benth.—*E. laurifòlia*, Lam.—*E. mellífera*, Ait.—*E. mìsera*, Benth.—*E. plumerioìdes*, Teysman.—*E. punicea*, Swartz. G.C. II. 15:529.—*E. resinífera?*—*E. scolopéndria*, Don.

Herbaceous forms: *E. Alèppica*, Linn.—*E. Charàcias*, Linn.—*E. Chamæsýce*, Linn.—*E. falcàta*, Linn.—*E. geniculàta*, Orteg.—*E. helioscòpia*, Linn.—*E. Ipecacuánhæ*, Linn. Plant of east U. S. coast region, root furnishing one of the officinal U. S. drugs.—*E. Lagáscæ*, Spreng.—*E. Paràlias*, Linn.—*E. pilòsa*, Linn.—*E. pilulífera*, Linn.—*E. spinòsa*, Linn.

Others not well known: *E. Amèlia*, Hort.—*E. aphýlla*, Brouss.—*E. articulàta*, Hort.—*E. aurèlia*, Hort.=E. Amelia?—*E. càput-odoràta*, Hort.—*E. Càput-Símiæ*, Hort.—*E. Cassýtha péndula*, Hort.—*E. colubrìna*, Hort.—*E. Coòperi*, Hort.—*E. dentàta*, Hort.—*E. de Smetiàna*, Hort.—*E. erècta*, Hort.—*E. fimbriàta*, Hort.—*E. funàlis*, Hort.—*E. gardeniæfòlia*, Hort.—*E. grácilis*, Hort.—*E. Houlletiàna*, Hort.—*E. Houllèti*, Hort.—*E. Kràusii*, Hort.=E. Kraussiana?=E. erubescens, E. Mey.—*E. longifòlia*, Hort.—*E. Mángador*, Hort.=E. Mogador, Hort.?—*E. Mauritània*, L.—*E. Morini*, Hort.—*E. abtùsa*, Hort.—*E. ornìthopus*, Jacq.—*E. Pavoénsis*, Hort.—*E. púlchra*, Hort.—*E. Pulletiàna*, Hort.—*E. Rebùti*, Hort.—*E. Richárdi*, Hort.=E. Richardiana.—*E. Sahariénsis*, Hort.—*E. San Salvador*, Hort.—*E. serpentaria*, Hort.—*E. viperìna*, Hort.—*E. Waltonénsis*, Hort.

J. B. S. Norton.

EUPTÈLEA (Greek *eu*, well, handsome, and *ptelea*, elm). *Trochodendràceæ.* Ornamental shrubs or small trees, with alternate, long-petioled, simple lvs. and small fls. appearing before the foliage, resembling somewhat the alder in habit and foliage. Three species from Himalayas to E. Asia, of which the half hardy Japanese species is sometimes cultivated; it prefers somewhat moist situations and is prop. by seeds or by grafting on their own roots.

polyándra, Sieb. & Zucc. Shrub or small tree, to 20 ft.: lvs. long-petioled, usually roundish ovate, cuspidate, coarsely and irregularly dentate, slightly pubescent on the veins beneath, 2–4 in. long: fls. in small, axillary, peduncled clusters, polygamous-diœcious, apetalous; stamens and carpels numerous: fr. consisting of many small winged nutlets, similar to the elm frs. Japan, China. S.Z. 72.

Alfred Rehder.

EÙRYA (Greek for *large*, but of no application). *Ternstrœmiàceæ.* Perhaps 20 shrubs of southern Asia and Malaya, with small diœcious fls., berry-like frs., and simple, glabrous evergreen lvs.: fls. in axillary clusters, or rarely solitary; petals and sepals 5; stamens 15 or less (rarely only 5), joined to the base of the corolla: ovary usually 3-loculed. The Euryas are allied to Camellias, and require much the same treatment. They are grown for foliage rather than for fls. Demand an intermediate temperature and a peaty soil. Prop. by cuttings taken from the tips of growing shoots. **E. Japónica**, Thunb. (*E. Sieboldii*, Hort.), is the common species, and is very variable. The variegated form of it (known in the trade as *E. latifòlia variegàta*) is one of the best glasshouse decorative pot shrubs: lvs. variable in shape, usually ovate-acuminate and irregularly toothed or notched, short-petioled, irregularly blotched with white: fls. greenish white, in small, axillary clusters. Japan. V.M. 23:5.

L. H. B.

EURÝALE (mythological name). *Nymphæàceæ.* One species, the Indo-Chinese representative of *Victoria Regia*, from which it differs in having all the stamens fertile (in Victoria the inner ones are sterile) and in the very small flower, and in other technical characters. **E. fèrox**, Salisb., is the species. The lvs. are 1–4 ft. across, circular, purple and spiny-ribbed beneath, dark green and uneven above: fls. small, prickly outside, the calyx reddish inside and the 20–30 purple petals shorter than the calyx lobes; stamens numerous: fr. a small, many-seeded, globular berry, bearing the remains of the calyx on its top; seeds edible. B.M. 1447. Long cult. in China. Treated as an annual. Has attracted little attention since the introduction of Victoria. As far north as Philadelphia it is hardy, sowing itself every season. It is ferociously spiny.

E. Amazónica, Poepp., still advertised in catalogues, is Victoria Regia.

L. H. B. and Wm. Tricker.

EURÝCLES (Greek-made name, of no particular application). *Amaryllidàceæ.* Two south hemisphere bulbous plants, allied to Hymenocallis and Pancratium. Perianth-tube cylindrical, the segments oblong-lanceolate and nearly equal; stamens inserted in the throat of the tube: lvs. broad and stalked, with prominent curving veins and interlocking veinlets: fls. white, in umbels. Cf. Baker, Amaryllideæ, p. 130. **E. sylvéstris**, Salisb. (*E. Amboinénsis*, Loud.). Brisbane Lily. Scapes 1–2 ft., bearing an umbel of 10–40 handsome, creamy white fls. (2 in. across), lvs. round-cordate, with a very short, blunt point. B.M. 1419, as *Pancratium Amboinense*. B.R. 9:715, as *Pancratium Australasicum*, Lindl. R.H. 1879, p. 456; p. 457 as *E. Australasica*, Loud. Malaya, Philippines, N. Australia. Grow in coolhouse, as for Pancratiums.

L. H. B.

EUSCÀPHIS (Greek, *eu* and *scaphis*, vessel; alluding to the shape and the handsome color of the dehiscent capsule). *Celastràceæ.* Ornamental shrub, with rather large pinnate, opposite lvs., small whitish fls. and attractive brownish red frs. in erect panicles, with shining black seeds. Monotypic genus allied to Staphylea, but with upright panicles and the capsules divided to the base into 3 dehiscent, leathery pods. It grows in almost any good garden soil, but is only half-hardy North. Prop. by seeds and greenwood cuttings under glass.

staphyleoìdes, Sieb. & Zucc. (*E. Japonica*, Dipp.). Shrub, to 10 ft.: lfts. 7–11, ovate-lanceolate, glabrous, serrate, 1½–3 in. long, each with 2 small stipules: fls. perfect, 5-merous, small, in many-fld. panicles: fr. consisting of 1–3 pods, each with 1–2 seeds. May, June. Jap. S.Z. 67.

Alfred Rehder.

EUSTRÉPHUS (Greek, referring to the climbing habit). *Liliàceæ.* One or two Australian plants, botanically related to Lapageria, but much less showy. In habit, suggestive of smilax (*Asparagus medeoloides*). **E. latifòlius**, R. Br., is a tall, half-twining, branchy herb, more or less woody at the base, bearing alternate, stiff, linear-lanceolate, short-stalked lvs. and small, axillary, drooping light blue fls. with spreading, ciliate perianth segments: fr. a dry berry: lvs. 2–4 in. long, sharp-pointed: fls. less than 1 in. across. B.M. 1245. Of easy culture, either in the glasshouse border or in pots. Very useful for table decoration and for design work.

L. H. B.

EUTÁCTA. Found under *Araucaria.*

EUTÉRPE (mythological name). *Palmàceæ*, tribe *Arèceæ.* Slender, erect, spineless palms, with solitary or fasciculate, ringed caudices. Lvs. terminal, equally pinnatisect; segments narrowly linear-lanceolate, long, and gradually acuminate or ensiform, membranaceous, plicate, the thickened margins recurved at the base; rachis and petiole 3-sided toward the base, convex on the back, concave above; petiole elongated; sheath very long, cylindrical, entire: spadix paniculately branched, rachis elongated: branches slender, gradually shortening above, usually scaly, thick at the base, erect-spreading in fl.: spathes 2, coriaceous or membranaceous, lanceolate, the lower one the shorter, split at the apex, dorsally 2-keeled, the upper one symmetrical, split down the ventral side: bracts bordering the furrows; bractlets ovate-acute: fls. small, white, sessile in the furrows of the spadix: fr. like a pea, purple. Species about 8. Trop. Amer. and W. Indies.

édulis, Mast. Para Palm. Assai Palm. Stem, 60–90 ft. high, 8 in. thick, flexuous: lvs. spreading; sheaths 3–4½ ft.; petiole 1½ ft.; blade 6–9 ft.; segments linear, spreading, deflexed, 60–80 on each side, densely crowded, 28–36 in. long, ¾–1 in. wide. Brazil.

oleràcea, Mast. CABBAGE PALM. Fig. 801. Stem 60–100 ft., scarcely 1 ft. in diam. at base, attenuate above, flexuous: lvs. arcuate-spreading, 4–6 ft. long, the apex more or less deflexed; segments pendent, linear-lanceolate, the upper 2 ft. long, 1 in. wide, many-nerved. Braz.—Fig. 801 is adapted from Martius' Nat. Hist. of Palms.

801. Euterpe oleracea.

montàna, R. Grah. Stem 10 ft. high, swollen at the base, ringed: lvs. 9 ft. long, elliptical-obovate; segments lanceolate, entire, glabrous, alternate; petiole 2 ft. long, scaly beneath, unarmed: rachis plano-convex below, subtriangular towards the apex. Grenada. B.M. 3874.

JARED G. SMITH.

Euterpes constitute a small group of spineless palms, said to include 8 or 10 species in all, but of these there are but 3 species commonly found in cultivation, namely: *E. edulis*, *E. montana* and *E. oleracea*. These are found under varying conditions in Central and South America and the West Indies, and all three species are valuable as food-producers to the natives of those countries. *E. edulis* grows in great quantities in the lowlands of Brazil, where it is known as the Assai Palm, owing to the fact that its seeds are macerated in water, and by this means is produced a beverage known as Assai. *E. oleracea* is the well-known Cabbage Palm of the West Indies, growing in the lowlands near the coast, while *E. montana* is the Mountain Cabbage Palm, and is frequently found at considerable altitudes in the same islands, and consequently does not attain the great dimensions of *E. oleracea*.

The Euterpes do not present any special cultural difficulties, being free-rooting and rapid-growing palms, a night temperature of 65° F., and abundant moisture, being among their chief requirements. A good, turfy loam, with the addition of about one-fifth of stable manure while in the compost heap, provides a suitable soil. From their habit of forming a tall, slender stem without suckering from the base, the Euterpes are liable to become rather leggy specimens. When under cultivation, and for trade purposes, it is advisable to group 3 or 4 of the young plants together, thus producing a more bushy specimen. White scale is one of the worst pests to which these palms are subject, and soon ruins the foliage unless care is taken. Seeds germinate in a few weeks if sown in a warm greenhouse, and the young plants make better progress when moderately shaded.

W. H. TAPLIN.

EUTÒCA. Now referred to *Phacelia*.

EVAPORATING OF FRUIT. While the domestic operation of drying fruit has been practiced ever since men looked beyond their immediate wants and stored food for time of greater need, and while dried fruit has long been an article of commerce, yet until a few decades ago only the most primitive methods were used in the drying process, and the industry, commercially, was confined to a few favored regions in Europe. The modern industry is scarcely more than a quarter century old. Its almost inconceivable growth in America in this brief time is one of the industrial phenomena of the epoch. Spurred into activity by the encroachments of the American product in their markets, the European producers, by the adoption of better methods, and by governmental encouragement, have increased greatly their output of dried fruit. And so, from an adjunct to fruit growing for home use, drying fruit has become, within recent years, one of the main branches of horticulture.

Fruit may be cured in the sun, or it may be cured in drying machines, called evaporators. That cured in the sun is called by the producer dried fruit; that in evaporators, evaporated fruit. By far the greater part of the world's product is cured in the sun.

Sun-drying fruit.—In countries having a sufficiently warm and dry climate, as Greece and Turkey, and parts of France, Spain and western America, fruit is dried almost wholly in the sun. The fact that in these favored localities the drying capacity is limited only by the acreage of sunshine, makes it certain that the proportion of sun-dried fruit will always be vastly greater than that of evaporated fruit. Drying fruit in the sun is a simple process, but one hedged in by many little arts and methods which facilitate the work and improve the product. In general, the process is as follows: the fruit is graded, bleached by sulfur, if a light colored product is desired, in the case of prunes dipped or pricked, and is then spread on trays to be exposed to the sun. When the drying process is finished the fruit is again graded, in most cases put through a sweat, and then "finished" in various ways, as by dipping or glossing.

Evaporating fruit.—There are hosts of styles of evaporators, but all possess in common a chamber for the reception of the fruit, through which a current of warm air is forced, or the fruit is forced through the air, or both, the object being to remove the aqueous matter from the fruit as quickly as possible, and the principle being that warm air will absorb more moisture than cool air. The saturated air must not remain in contact with the fruit. Since different fruits exact different conditions, one should be able to change the temperature and velocity of the air current in the drying chamber at will. To make the product homogeneous, current and temperature must be equal in all parts of the evaporator. It is obvious that simplicity in the machine and economy in heat and in room are cardinal virtues in a good evaporator. It is the rule to start the evaporation of large fruits at a low temperature and finish at a high one, but with berries the reverse is true. Some operators start their apples high and finish at a low temperature.

The following are definitions of the somewhat technical terms used in the industry: *Bleaching* is the process of changing the dark color of fruit to a lighter hue, or of preventing the discoloration; generally accomplished by sulfuring. *Bloaters* are prunes which in drying swell up to an abnormal size; generally produced by fermentation in over-ripe fruit. *Dipping* is the process of cutting the skin of fresh prunes to facilitate curing. The operation is performed by submerging the fruit in boiling lye. Cured fruit is sometimes dipped in one of various solutions as a "finishing" process. *Drip* is the syrupy liquid which oozes from prunes in the process of evaporation; it generally characterizes a poor prune or a poor evaporator. *Frogs* are cured prunes having an abnormal shape; a condition caused by curing unripe fruit. *Pricking* is the process of puncturing the cuticle of fresh prunes. It is done by means of a machine, the essential part of which is a board covered with projecting needles, over which the prunes must pass. It accomplishes the same end as lye dipping. *Sizes* is a term used to indicate the number of cured prunes it takes to make a pound. The "four sizes" known in the markets are 60s–70s, 70s–80s, 80s–90s, 90s–100s. *Sugaring* is the formation of globules of sugar on the cuticle of cured prunes. *Sulfuring* is a process cured fruit is put through to give it a lighter color. The fruit is subjected to fumes of burning sulfur before being exposed to the sun or put in evaporators. *Sweating* is a process cured fruit is subjected to before packing, in which it is put in a room at a high temperature and allowed to become moist.

Curing different fruits.—Apples and pears are peeled, cored, cut in rings or quarters, and sulfured, before being placed upon the drying trays. The time required for curing is about three days out of doors and six to twelve hours in the evaporator. There is considerable trade in apples called "dumplings," which are whole apples peeled and cored. Double the time is required in evaporating them, but the price is higher.

Apricots, peaches and nectarines must be fully ripe before drying and without bruises. They are pitted, and may or may not be peeled. If peeled, the operation is done with machines or with lye, though the use of the latter is considered a bad practice. The fruit is placed on the trays cup side up. About three days are required for drying in the sun and about eight hours are required for evaporating. The cured product should be of a translucent amber color.

Berries are seldom sun-dried for the markets. For evaporating they are placed on trays in quantities of from sixteen to thirty quarts, given a temperature of about 175 degrees at the start, and are finished in from four to five hours, at a temperature of about 100 degrees. After being taken from the evaporator, they are piled for sweating in a warm, ventilated room.

Figs for drying must be gathered when fully ripe. Some growers prefer drying in shade rather than in sun. Evaporators are seldom used. The fruit is not allowed to dry hard, and before packing must be well sweated. Usually, for "finishing," they are dipped in salt water or syrup. The drying process requires from five to eight days.

Prunes are allowed to ripen until they fall to the ground. Before being spread on the trays they are dipped or pricked in order to thin or crack the skin, that the moisture may easily escape, and dripping be prevented. Sun-drying requires from one to three weeks, while from sixteen to thirty hours are required for evaporation. A thorough sweat prevents the sugaring so common to this fruit. Before packing they are graded in sizes. Dipping as a "finishing" process is practiced by many producers. A good prune is soft, smooth and meaty, with loose pit, and of an amber, dark red or golden hue, depending upon the variety.

Grapes for raisins are sun-dried. They must be picked when fully ripe, the bunches, and the berries on the bunches, being sorted as the picking progresses. The operation of drying must be watched with care. The process requires from eight to fourteen days, during which time the bunches must be turned at least once. A sweat is given before packing. Raisins are graded into half a dozen or more brands for the market.

U. P. Hedrick.

EVENING PRIMROSE. See *Œnothera.*

EVERGREEN. Said of plants which do not shed all their foliage at any one time, thereby remaining green; or of leaves which persist for two or more years. In all evergreen plants, the old leaves shed after a time, when they become so overshadowed or crowded as to be of no further use to the plant. The leaves of pines and spruces persist for three to fifteen years.

In the popular mind "Evergreen" and "Conifer" are the same, but some conifers are deciduous, as the larches and taxodiums. Moreover, in the tropics most trees and shrubs are evergreen or nearly so. In the mind of the gardener, evergreen and conifer are thoroughly dissociated, and in works on gardening hundreds of greenhouse plants are called "evergreen," which represents dozens of families besides the Coniferæ. Evergreens other than conifers are sometimes called "Broad-leaved Evergreens." See *Conifers.*

EVERLASTING. A term applied to flowers or plants which retain their shape and other characteristics after being dried. Equivalent to the French word Immortelle (see Revue Horticole, 1890, p. 521).

The most important commercially of the flowers which retain their form and color in a dried state are the French Immortelles, *Helichrysum arenarium.* These flowers are used very extensively in France in their natural yellow color, for the manufacture of memorial wreaths and crosses, which, being constructed very compactly, are exceedingly durable, even in the severest weather, and are exported in large numbers to all parts of the world. The flowers bleached white, or bleached and then dyed in various colors, are also shipped in enormous quantities, either direct to this country or through some of the large exporting houses of Germany. Approaching the French Immortelles in aggregate value are the so-called Cape Flowers, *Helichrysum grandiflorum*, which have reached an enormous sale in this country within a few years, and have largely supplanted the Immortelles on account of their silvery texture and greater beauty every way. They are naturally white, but require bleaching in the sun to give them the desired luster. They come from the Cape of Good Hope, and reach this country mainly via Hamburg.

The common Everlasting of American and English country gardens, *Helichrysum bracteatum*, is the only one of these everlasting flowers grown to any extent in America, and more or less extensive cultivation of them, commercially, has been practiced in this country, but still a large percentage are imported. They come in white, straw and brown colors naturally, and take readily to a variety of artificial tints; these, together with *Ammobium alatum* and the well known Globe Amaranth, *Gomphrena globosa*, are grown and used to a considerable extent by the country folk in the construction of the many forms of wreaths, stars, and other Christmas greens, which they sell in the city markets in large quantities, but their sale by wholesalers and jobbers for general consumption is very limited. *Statice incana*, cultivated or wild from the swamps of southern Europe, and Gypsophila in several species are used to a considerable extent, and the sale of Statice especially, which is popular in combination with Cape Flowers in memorial designs, is quite an item with the dealers in florists' supplies.

Of the dried grasses, the Pampas Plumes of California, *Gynerium argenteum*, native of South America, are the only American production attaining any great commercial importance. Their beautiful silky plumes, unapproached by any other horticultural product, are used in enormous quantities for decorative purposes, and are an important item of American export. They are used mainly in sun-bleached state, but more or less dyeing, often parti-colored, is also done. *Bromus brizæformis* is the most extensively used of the smaller grasses. It is mostly imported from Europe, via Erfurt, but has been grown in considerable quantity in Michigan. It can be imported, however, including duty, for about 25 per cent less than it is possible to grow it in this country. It is handled in the natural state. *Briza maxima*, another popular grass, is grown in Italy, whence it is shipped to America, Philadelphia being the largest importing port. *Briza media*, a medium sized grass, and *Briza minima*, the flowers of which are as fine as saw-dust, are also handled in the same manner as *Briza maxima*, very little of the *B. minima* being used dyed, however. *Phleum pratense*, *Stipa pennata*, and various kinds of oats have more or less commercial value, being used considerably in the manufacture of imitation flowers and straw goods, but from a florist's standpoint, they are not important. The most important commercially of the imported grasses is the Italian wheat, the quantities used in this country for the manufacture of sheaves for funeral purposes being enormous, and increasing yearly. It comes in many grades of fineness and length of stem. In this country all attempts to cultivate it in competition with the European product have failed.

Outside of wheat, it is generally true that the use of dried grasses and flowers in this country is on the decline. The fondness of our people for fresh flowers, and the abundance in which these are now offered, everywhere, at all seasons, is largely responsible for the decadence of the fancy for dried flowers. Another factor is the artificial flower industry, which, in France particularly, has attained a wonderful perfection, the materials being principally metal, porcelain, wax or cloth. In Europe, especially in Germany, the grasses seem to maintain their popularity, and it is to these foreign-born people that a large part of the material imported here goes.

A number of our native Composites—of the genera Gnaphalium, Antennaria and Anaphalis—are called Everlastings, and are often used in home decorations, particularly in the country; but they have no commercial rating.

H. BAYERSDORFER.

EVÒDIA (Greek, *pleasant odor*). *Rutàceæ*. Between 20 and 30 trees or shrubs of the Old World tropics, with opposite, punctate, simple or compound lvs. and small fls., in terminal or axillary cymes. Fls. unisexual; sepals and petals 4–5; stamens 4–5, inserted at the base of a cup-shaped disk; stigma 4-lobed. Warmhouse evergreens. Prop. by cuttings of half-ripened wood. **E. élegans**, Hort., from New Guinea, is a new plant resembling *Aralia elegantissima*. Lvs. prominently 3-lobed, undulate and crenate. **E. formòsa** is another new species int. 1900 by Sander & Co.

ÉXACUM (classical name, of no significance to these plants). *Gentianàceæ*. An oriental genus of about 20 species, including 3 kinds of herbs, treated either as annuals or biennials, with 5-lobed fls. of lilac, blue or dark purplish blue. Cult. in a very few greenhouses. The genus has no allies in its tribe of garden value. Herbs, dwarf and annual, or tall and paniculate-branching: lvs. sessile, clasping or short-stalked: fls. small or attaining 2 in. across, lilac, violet, blue or white, pedicelled or not, in forking cymes; calyx 4–5-parted, the segments keeled, winged or flat and 3-nerved; corolla tube short; lobes 4 or 5, ovate or oblong, twisted; stamens 4 or 5, attached to the throat, with very short filaments.

According to "K.F." in Gng. 6:229, *E. affine* can be grown in a greenhouse where the temperature ranges from 55–60° F. The showier indigo-blue *E. macranthum* requires a warmer house. The color of the fls. of *E. affine* varies according to the treatment. If kept in bright, sunny quarters they assume a bluish lilac color; in the shade, blue to deep blue. Plants flower in August. If specimens in 5-in. pots are desired, sow in March of the same year; for larger specimens, sow in August of the preceding year. The plants must be kept in a cool but not draughty greenhouse or frame in summer, and shaded from fierce sunlight. The usual precautions needed for very small seeds should be observed. They should receive their moisture from below, as overhead sprinkling disturbs the sprouting seeds.

A. *Lvs. with stalks often ½ in. long.*

affine, Balf. Stem cylindrical, 1–2 ft. high, much branched from the base: lvs. 1–1½ in. long, elliptic-ovate, faintly 3–5-nerved: sepals with a broad wing on the back; corolla 6–9 lines wide; lobes almost rounded. Socotra. B.M. 6824. A.F. 13:1104. Gng. 6:229. R.H. 1883, p. 512. Gt. 32:1108. G.C. II. 21:605.

A. *Lvs. nearly or quite stalkless.*

B. *Corolla lobes rounded.*

Zeylánicum, Roxb. Annual: stem 4-sided, branched only above: lvs. becoming 3 in. long, strongly 3-nerved, elliptic-oblong, acuminate, narrower than in *E. affine*, and tapering: fls. 1½ in. across, in terminal, leafy corymbs; sepals broadly winged; corolla lobes obovate, obtuse. Ceylon. B.M. 4423 (sky-blue, with a dash of purple). R.H. 1859, p. 238.

BB. *Corolla lobes tapering to a point.*

macránthum, Arn. (*E. Zeylánicum*, var. *macránthum*). Stem cylindrical, slightly branched: lvs. as in *E. Zeylanicum*, though perhaps more variable from base to summit: fls. 2 in. across. In both species there is a narrow ring of yellow at the mouth, to which the conspicuous clusters of stamens are attached. Ceylon. B.M. 4771 (deep purplish blue). G.C. III. 15:331.—The best of the genus. The rich, dark blue is worth striving for. Reintroduced by Sander & Co. 1899.

W. M.

EXCŒCÀRIA sebifera. See *Sapium*.

EXHIBITIONS of horticultural products may be made for either of two purposes,—to illustrate the subject or thing itself, or to illustrate an ideal. As a matter of fact, all Exhibitions of domesticated products are for the latter purpose. If an Exhibit were made of what a species actually is—whether dahlia, peach or pumpkin—hostility would be aroused, for in that case the incapabilities as well as the capabilities of the plant would be shown. Exhibits are really made up of those selected forms which most nearly approach an ideal. This ideal may be a commercial one or an artistic one. The commercial ideal is likely to be held up as the only one. It is usually held dogmatically, and one who has another ideal is a heretic. A so-called show plant, as a chrysanthemum or a dahlia, may represent only one of the many possibilities of the species: and each of these possibilities may be worth the cultivating. It is a significant fact that many of the commercial types are not the most artistic or the most satisfactory ones. They are usually those which are most certain to give uniformly profitable results to the grower. The constant forcing of these types on the public attention tends to popularize them. The chrysanthemum admirably illustrates these remarks: the extra-large show blooms are less satisfactory and agreeable to most persons than freer, smaller and more individual blooms.

The Exhibition ideal in any fruit or plant has a powerful influence on the evolution of the plant. People breed for that ideal. They discard those forms which contradict the ideal. Persons who care less for the formal ideal than for variety, individuality and artistic merit are amateurs in the best sense of the word. Skilled amateurs usually deal with more varied and difficult subjects than the professionals or commercial growers. It is remarkable how plants have been bred to the Exhibition standard. The practice of carding and dressing of the carnation in earlier times has produced the high-centered, flat-bottomed carnation of today. In England, the carnation ideal has been an entire or rose-leaf petal; in America, the ideal is a moderately fringed petal. Perhaps the effect of the Exhibition ideal is nowhere so well seen as in the custom of exhibiting single blooms: it has developed the individual flower rather than the plant as a whole. The chrysanthemum, dahlia and camellia are examples. The Old World custom of showing single blooms of florists' flowers in holes in a board or in sand—like so many heads in a pillory—enforces the ideal of the single flower. Fortunately, this type of Exhibition has had little popularity in this country. A comparison of the pictures of prize Exhibition subjects in European and American journals would show some interesting contrasts. It would contrast single-flower or single-specimen ideals with bouquet ideals in florists' flowers.

In general terms, the entire plant is the unit, rather than the flower or fruit alone. The love of flowers is only the beginning of wisdom. The love of plants is a higher stage. It is pleasing that American Exhibitions are more and more given to plants and to artistic displays. The Old World Exhibitions, while emphasizing the single-flower ideal in florists' plants, are very rich in displays of specimen plants of other kinds.

Every Exhibition should make its motive or animus clear. The visitor should know whether it is the purpose to show florists' ideals, amateurs' ideals, or both. The best Exhibition of any subject is that which shows all its possibilities and merits. The tendency is for the amateur's ideals not to be seen at the shows. There are fewer prizes for these ideals, and the amateur leaves his choicest things at home. Yet the amateur is the conservator of meritorious plants. He holds interesting and artistic varieties and species decade after decade, and prevents their loss. It is the amateur who has kept the old Laciniatum chrysanthemum against the changing moods of the trade. Consider that the greater number of species described in this Cyclopedia are known only to the amateur. Our horticulture would be poor indeed if only commercial ideals should prevail.

A leading value of an Exhibition is to maintain a society. The annual or periodical show keeps alive interest in the society, and thereby enables the society to extend its beneficent work. The great displays made by the American Pomological Society, the Society of American Florists, the American Carnation Society, and other organizations, are excellent examples of the value of an Exhibition in aiding to maintain a society with educational functions. This gives a suggestion for the local improvement society: have an Exhibition in spring and fall. Invite the professional growers to show their specialties at the local show. It is well to make some one plant or group of plants a central feature of each show; and this plant should be shown in all its various forms. Endeavor to interest people in plants themselves, even though they may not show the formal ideals of the plant-breeder. Good subjects for these central features are the different fruits and vegetables, roses, carnations, chrysanthemums, dahlias, gladioli, spring bulbs, aquatics, bog plants, alpine plants, cacti, orchids, poppies, sweet peas, violets, ferns, peonies, ornamental autumn fruits, wild flowers, bloom of hardy shrubs, foliage or bloom of forest trees, and vines.

Aside from these technical uses of the Exhibition in illustrating the progress of plant-breeding, the show also may be made a powerful means of extending and deepening the love of nature. In this guise it will appeal to every person, not to horticulturists only. In every school an Exhibition once or twice a year should be made an adjunct of nature-study instruction. Such an Exhibition should not stop with plants, but include all natural objects. It should not be a technical horticultural Exhibit; and therefore, its further discussion is not germane to this work. L. H. B.

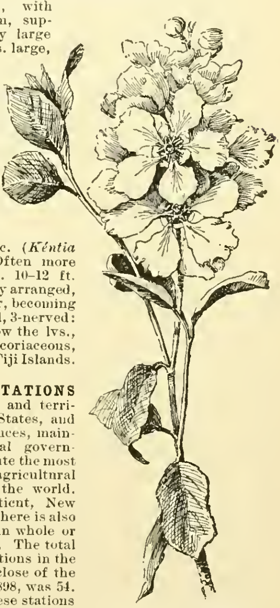
EXOCHÓRDA (from *exo*, external, and *chorde*, a cord or thong; suggested by the free placentary cords supposed to be external to the carpels). *Rosàceæ.* Hardy shrubs or small trees, remarkable for the structure of the fr., which is composed of 5 small, bony carpels, adhering around the central axis in a star-like manner. Allied to Spiræa. Prop. by seeds, cuttings and layers. Seeds are produced only on old plants; cuttings root slowly and with difficulty; layering is best. Seed propagation is advisable when seeds can be obtained.

grandiflòra, Lindl. PEARL BUSH. Fig. 802. Well known garden shrub, not often over 6–8 ft., but sometimes 15 ft.: lvs. petiolate, lanceolate-oblong, whitish below, very strong toothed on strong shoots, but almost entire upon the older parts, stipuled: fls. appear with lvs. in long, terminal racemes of 5 or 6 fls., pure white; calyx deeply 5-cleft; petals 5, narrow, roundish and clawed; stamens 10–15, short: fr. of 5 bony, 2-valved carpels joined to a common axis, each with 1 large, flat-winged seed. Apr., May. Central China. F. S. 9:954. Gt. 47:1455. R. H. 1896, pp. 324, 325. J. H. III. 34:483. B.M. 4795. A.F. 6:343. Gng. 5:97. G.C. II. 16:73; III. 7:613.—Open habit and with thin, uninteresting foliage. Individual fls. of no value. Useful only in bloom, when it is a dazzling white, the most brilliant shrub of its season. Can be kept in shape by pruning, but better back of or massed with other shrubs. Thrives in any good soil.

Álberti, Regel. Of greater vigor, darker foliage, covered with spikes of pure white fls., 8–10 on a spike. Becomes 6 ft. Turkestan. For its garden value, see Gng. for Oct. 1, 1899. A. PHELPS WYMAN.

EXORRHÌZA (*exo*, out, outside, *rhiza*, root; alluding to the large aërial roots above the ground). *Palmàceæ.* High-growing palm, with straight, smooth stem, supported at the base by large aërial, spiny roots: lvs. large, pinnate. Allied to Kentia, but distinguished by the imbricate sepals of the sterile fls., the elongated, subulate filaments of the stamens, by the roundish-ovate sepals of the pistillate fls. and by the parietal ovule. In Kentia the ovule is basal and erect.

Wendlandiàna, Becc. (*Kéntia exorrhìza*, Wendl.). Often more than 60 ft. high: lvs. 10–12 ft. long: pinnæ alternately arranged, 1–2 in. from each other, becoming 4 ft. long and 2 in. broad, 3-nerved: spadix appearing below the lvs., enveloped in thick, coriaceous, boat-shaped spathes. Fiji Islands.



802. Exochorda grandiflora. (×⅓.)

EXPERIMENT STATIONS exist in all the states and territories of the United States, and in the Canadian provinces, maintained by the general governments. These constitute the most extensive series of agricultural research stations in the world. In Alabama, Connecticut, New Jersey and New York there is also a station maintained in whole or in part by state funds. The total number of regular stations in the United States, to the close of the fiscal year, June 30, 1898, was 54. The total income of these stations was $1,210,921.17. In the work of administration and inquiry, these stations that year employed 669 persons, of whom 77 were horticulturists. In that year, these stations published 406 reports and bulletins. The mailing lists aggregated half a million names. Summaries of all these publications are published by the Office of Experiment Stations, Department of Agriculture, Washington, in the monthly "Experiment Station Record."

In the Dominion of Canada there are five Experimental Farms. One of these is known as the Central Experimental Farm, and is located near the capital, Ottawa, and serves the purposes of the two large provinces of Ontario and Quebec. The other four are branch Experimental Farms, sites for which have been selected in different parts of the country, as follows: One at Nappan, Nova Scotia, which serves for the three maritime provinces; a second at Brandon, Manitoba, which serves the purposes of that large prairie province; a third at Indian Head, N. W. T., which serves the purposes of the provisional districts known as the Northwest Territories of Canada; and the fourth is at Agassiz, in the coast climate of British Columbia, and meets the need of the latter important province. The grant made for the maintenance of the five Experimental Farms has been $75,000 per annum until 1899, when this was increased to $80,000. At the Central Farm there are six officers engaged in research, and two at each of the branch farms, excepting at Agassiz, B. C., where there is only one. The publications relating to the work at all the Experimental Farms are issued from the Central Farm at Ottawa.

F

FABA. See *Vicia.*

FABIÀNA (after Francisco Fabiano, Spanish botanist). *Solanàceæ.* This group is a series of surprises. It contains 16 species of heath-like shrubs from South America. They are dwarf, erect, much branched, and *F. imbricata* has lvs. suggesting an arborvitæ, being scale-like, overlapping, and densely crowded. The flowers resemble a heath in size and profusion, and their culture is the same as Erica. They belong to the same family with the potato. The fls. are club- or funnel-shaped, of 5 semi-cylindrical portions grown together at the edges and crowned by a limb of 5 short, rounded, spreading lobes. At present it seems to be cult. only in S. Calif. and the South. Abroad it is cult. under glass in winter and put outdoors in summer.

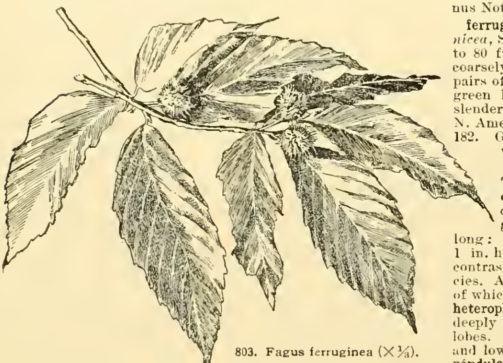
imbricàta, Ruiz & Pav. Height 3 ft.: lvs. scale-like, imbricated: fls. sessile, white. Spring. Peru. B.R. 25:59.

FAGÈLIA (after Caspar Fagelius). *Leguminòsæ.* A fast-growing, twining subshrub from S. Africa, covered with clammy hairs, and bearing all summer axillary racemes of pea-like fls. which are yellow, the keel tipped violet. Cult. outdoors in S. Calif. and abroad under glass. The plant is allied to Cajanus, but is a genus by itself, chiefly because its seeds are strophioled, pod swollen, not flattened, and the 2 upper calyx lobes nearly distinct.

bituminòsa, DC. Leaflets 3. B.R. 3:261, as Glycine, showing fls. also veined with red.

FAGOPÝRUM (*beech wheat*, from the likeness of the fruit to a beech-nut). *Polygonàceæ.* Probably only two species of Eu. and N. Asia. Quick-growing annuals, with alternate deltoid or hastate lvs., small honey-scented fls. in racemes or panicles, 5-parted calyx, 8 stamens, 1-loculed ovary ripening into a floury, 3-angled akene.

esculéntum, Mœnch. BUCKWHEAT (which see). Fig. 276, p. 186. Lvs. large and broad, long-petioled: fls. white, in panicled or corymbose racemes: akene or grain with regular angles.



803. Fagus ferruginea (×⅓).

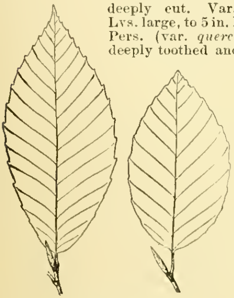
Tatáricum, Gærtn. INDIA WHEAT. DUCKWHEAT (which see). More slender: lvs. smaller and hastate or arrow-shaped, shorter-petioled: fls. greenish or yellowish, in small, simple racemes: akene with wavy or notched angles. Useful in short-season climates and on poor soil.

L. H. B.

FÀGUS (ancient Latin name). *Cupuliferæ*, tribe *Fagàceæ.* BEECH. Tall, deciduous, hardy trees, of noble, symmetrical habit, with smooth, light gray bark and clean dark green foliage, which is rarely attacked by insects or fungi. They are among the most ornamental and beautiful trees for park planting, and attractive at every season, especially in spring, with the young foliage of a tender, delicate green, and the graceful, drooping heads of the staminate fls. The American and the European species are much alike, but the first has the bark of a lighter color, the head is broader and more roundish, and the lvs. less shining, but turning clear yellow in fall, while the latter has a more ovate head and shining foliage, which turns reddish brown in fall and remains on the branches almost through the whole winter. It is sometimes used for tall hedges. In Europe the Beech is a very important forest tree, and the hard and very close-grained wood is largely used in the manufacture of different articles and for fuel; but it is not very durable in the soil. The sweet nuts are edible, and in Europe an oil is pressed from them, used for cooking and other purposes. The Beech prefers dryish situations, and grows best in sandy loam and in limestone soil. Prop. by seeds sown in fall where there is no danger of them being eaten by mice, or dried after gathering and kept mixed with dry sand until spring. The young plants should be transplanted every second or third year; otherwise they make long tap-roots, and cannot always be transplanted successfully. The varieties are grafted on seedling stock, usually in the greenhouse in early spring; grafting in the open usually gives not very satisfactory results. Five species occur in the cooler regions of the northern hemisphere, all large, deciduous trees, with alternate, distichous, dentate or nearly entire lvs.: fls. monœcious, with the lvs.; staminate in slender-peduncled, pendulous heads appearing at the base of the young shoots; perianth 5–7-lobed; stamens 8–13; pistillate with 3 styles, usually two in an axillary peduncled involucre: fr. a brown, ovate, triangled nut, 1 or 2 in a prickly, dehiscent involucre. The species of the southern hemisphere, often included under Fagus (as *F. betuloides* and others), form the genus Nothofagus, which see.

ferrugínea, Ait. (*F. Americàna*, Sweet. *F. atropunicea*, Sudw.). AMERICAN BEECH. Figs. 803, 804. Tree, to 80 ft., rarely 120 ft.: lvs. ovate-oblong, acuminate, coarsely serrate, silky beneath when young, with 9–14 pairs of veins, dark bluish green above, light yellowish green beneath, 2½–5 in. long: involucre covered with slender, straight or recurved prickles, ¾ in. high. E. N. Amer., west to Wis. and Texas. S.S. 9:444. Em. 182. G.F 8:125. A.G. 12:711. Var. **latifòlia,** Loud., with broader and larger, strongly toothed lvs.

sylvática, Linn. EUROPEAN BEECH. Fig. 804. Tree, to 80 ft., or rarely 100 ft.: lvs. ovate or elliptic, remotely denticulate, silky beneath and ciliate when young, with 5–9 pairs of veins, dark green and glossy above, pale beneath, 2–4 in. long: involucre with mostly upright prickles, about 1 in. high. M. and S. Europe to Caucasus. Fig. 804 contrasts the lvs. of the American and European species. A great number of varieties are in cultivation, of which the following are the most remarkable: Var. **heterophýlla,** Loud. (var. *asplenifolia*, Lodd.). Lvs. deeply cut, often almost to the midrib, into narrow lobes. A very graceful variety, forming a dense and low, shrubby tree. Mn. 1, p. 61. P.G. 3:163. Var. **péndula,** Lodd. With long, pendulous branches, the larger limbs mostly horizontally spreading. Gn. 55, p. 267. G.F. 1:32. Var. **purpùrea,** Ait. (var. *atropurpurea*, Hort.). Fig. 805. Lvs. purple. A form with very dark purple lvs. and of compact habit is var. **purpùrea Riversi,** Hort. There are other forms, differing in the shade of purple, and also some with rosy pink variagated lvs. Var. **purpùrea pendula**, Hort., has purple lvs. and pendulous branches, but is of slow growth. Var. **Zlàtia**, Spaeth, has yellow foliage. Less important varieties, but sometimes grown, are the following : Var. **cristàta**, Lodd., with deeply toothed, curled, small and clustered lvs.: of slow growth. Var. **incìsa**, Hort. Similar to var. heterophylla, but lvs. less deeply cut. Var. **macrophýlla**, Hort. Lvs. large, to 5 in. long. Var. **quercoìdes**, Pers. (var. *quercifolia*, Hort.). With deeply toothed and sinuate, rather narrow lvs. Var. **tortuòsa**, Hort. Dwarf form, with twisted and contorted branches and small lvs.



804. Fagus ferruginea (left), and F. sylvatica (×⅓).

F. Japónica, Maxim. Lvs. small, elliptic, crenate: involucre small, slender-peduncled, half as long as the nuts. Japan.—*F. Sièboldi*, Endl. Lvs. ovate, shortly acuminate, crenate, with 9–14 pairs of veins: lower prickles of the involucre changing into slender linear or obovate-oblong lobes. W. Asia to Japan.

ALFRED REHDER.

Both in Europe and the eastern U. S. the Beech forms extensive forests. It is to-day the common hardwood tree of Central Europe, particularly in Denmark and Germany, raised as pure growth or mixture. It requires a loamy, preferably calcareous soil, shuns poor sand and swamp, ascends to 3,500 ft. in the Alps; prefers north and east exposures, endures much shade, protects and improves the soil, and produces large amounts of wood per acre. The wood is heavy (sp. gr. 0.65–0.75) hard, straight grained, of close texture, not durable. Beech is not used as building lumber, but is extensively used for ordinary wooden ware, furniture, wheelwright and cooperage stock.

F. ROTH.

FAIR MAIDS OF FRANCE. Double forms of *Ranunculus aconitifolius.*

FAIRY LILY. *Cooperia pedunculata.*

FANWORT. See *Cabomba.*

FARFUGIUM. See *Senecio Kæmpferi.*

FÁTSIA (from a Japanese name). *Araliàceæ.* This genus is doubly interesting as producing the famous rice paper of the Chinese, and two superb rivals of the castor oil plant in bold, subtropical effects, made by large lvs. which spread out like fingers. Fatsia has 3 species of trees or small shrubs belonging to the Panax series, in which the petals are valvate, while in the Aralia series they are more or less overlapping, but the sides affixed at the base. Within the Panax series, Panax itself has the pedicel articulated under the flower, while in Fatsia and Acanthopanax the pedicel is continuous with the flower. Fatsia is distinguished from the hardier and less familiar but worthy Acanthopanax by the greater length and distinctness of the styles.

While Fatsias require more care in the North than the hardy Aralias, their massive, subtropical appearance is highly distinct. A perfect specimen is figured in Gardening 5:133, where W. R. Smith says of *F. papyrifera:* "This plant produces the beautiful substance known as rice paper; it grows to 10 ft. high, with a stem 4 in. in diam., full of white pith like the elder; in a full-grown specimen the pith is about 1 in. in diam. It is divided into pieces 3 in. long, and by the aid of a sharp instrument is unrolled, forming the thin, narrow sheets known as rice paper, greatly used by the Chinese for drawing figures of plants and animals, and also for making artificial flowers. Until about 1850 the source of this substance was unknown to scientists. The Chinese, on inquiry, gave very fanciful figures and descriptions of it. * * * It is destined to be a people's plant, as one-half inch of the root will grow and form a good plant the first season. It has survived most winters for the past five years in Washington, D. C."

As associates in groups of bold-habited plants, F. W. Burbidge (Gn. 45, p. 321) suggests *Polygonum Sachalinense, Chamærops Fortunei* and *Rodgersia podophylla.* For contrast with feathery and cut-leaved foliage, he suggests bamboos, aucubas, cut-leaved maples and various ivies. For culture of Fatsias as greenhouse plants, see *Aralia.* The two oriental species are unarmed. *F. horrida,* from western N. Amer., is a spiny plant cult. abroad. Siebert and Voss declare that most of the plants sold as *Fatsia Japonica* are *Aralia spinosa.* These plants like shade. Full sunlight for an hour or two in early morning is enough. They should have a shelter-spot, where the wind will not whip their foliage.

papyrifera, Benth. & Hook. (*Aràlia papyrífera*, Hook.). Height 5–7 ft.: branches and young lvs. covered with stellate, more or less deciduous down: mature lvs. reaching 1 ft. long, cordate, 5–7-lobed ; lobes acute, serrate ; sinus very deep: fls. inconspicuous, white, in sessile, globose clusters. Formosa. B.M. 4897. A.F. 7:385. Gng. 5:133. Gn. 45, p. 321.

Japónica, Dcne. & Planch. (*Aràlia Japónica*, Thunb., not Hort.? *A. Sièboldii*, Hort.). Lvs. downy at first, finally shining green: fls. in umbels. Jap., China.—Abroad are cult. forms with white or golden margins and a form reticulated with gold markings.

W. M.

FEATHER GERANIUM. *Chenopodium Botrys.*

FEIJÒA Sellowiana is considered a promising fruit plant in S. France. The frs. are about 2½ in. long, 2 in. thick, and 4-celled. The flesh is thick, white, pulpy and watery, with a sugary taste, resembling the pineapple and the guava, and with a strong, agreeable odor. Int. 1890 from La Plata. R.H. 1898:264. G.C. III. 24:451. Gn. 54, p. 208. Order *Myrtàceæ.*

FELÍCIA (for Herr Felix, a German official). *Compósitæ.* Much like Aster, from which it differs in having pappus bristles in one series, and in other technical characters. Forty to 50 herbs or subshrubs in Afr.

805. Good specimen of Purple Beech—Fagus sylvatica, var. purpurea.

amellòdes, Voss, (*Cinerària amelloìdes*, Linn. *Aster rotundifòlius*, Thunb. *A. Capénsis*, Less. *Agathæa cœléstis*, Cass. *B. rotundifòlia*, Ness. *A. amelloìdes*, DC.). Blue Daisy. Blue Marguerite. Fig. 806. An old greenhouse plant, 1–2 ft., with roundish ovate opposite lvs. and large, solitary heads of an exquisite sky-blue. S. Afr. B.M. 249 (as *Cineraria amelloides*). A.F. 13:657. F.R. 1:674. Gng. 6:149.—There is a variegated-lvd. var. (I.H. 8:296). Grown easily from cuttings. Handled like a Cineraria; or, if grown from spring cuttings for winter bloom, like a Chrysanthemum, but with more heat in the fall. An elegant pot-plant, and useful for bedding in a protected place. L. H. B.

FENDLÈRA (after Augustus Fendler, a German naturalist, botanical explorer of New Mexico). *Saxifragàceæ.* Low, spreading shrub, with small, opposite, greyish foliage, covered in June along the slender, arching branches with graceful white fls., resembling in shape a Maltese cross. Hardy in New England, and growing best in a well-drained, sandy or peaty soil and sunny position. A very handsome and graceful plant for sunny rockeries or rocky slopes. Prop. by seeds or by greenwood cuttings under glass. One species from Texas to Mexico; allied to Philadelphus. Fls. usually solitary at the end of short lateral branchlets; calyx lobes and petals 4; stamens 8: ovary almost superior: fr. a 4-celled, dehiscent capsule, with flat, oblong seeds.

806. Blue Daisy—Felicia amellodes (× ⅓).

rupícola, Engelm. and Gr. To 4 ft.: lvs. linear-lanceolate or linear-oblong, 3-nerved, revolute at the margin, greyish tomentose beneath, ½–1 in. long: fls. milky white, 1 in. across; petals rhombic ovate, with distinct claw, spreading; stamens erect. June. G.F. 2:113. R.H. 1891, p. 42. M.D.G. 1899:231.

Alfred Rehder.

FENNEL. Species of *Fœníeulum* (Umbelliferæ), annuals or treated as such, used as salad or condimental herbs. Native of S. Europe. The common Fennel (*F. officinàle*, Linn.) is grown mostly for its young lvs., which are used in flavoring, and also for its aromatic seeds. Leaves sometimes eaten raw. Sow seeds in late fall to ensure early germination in spring, or sow in early spring. In any good soil, the plant comes to maturity quickly.

The Florence or Sweet Fennel is *F. dúlce*, DC. The bases of the crowded leaf-stalks are much thickened, making a bulb-like enlargement above the ground. This thickened base has an oval form in cross-section. Earthing-up blanches these thickened leaf-bases, and after boiling they are fit for eating. A good Fennel bottom may be 3 or 4 inches high. This is an Italian vegetable, but is in the Amer. trade. Easily cultivated annual; matures quickly. Sow in spring, and later for succession.

Giant Fennel is cult. for ornament, and is described under *Ferula*. Fennel Flower is a name of Nigella.

L. H. B.

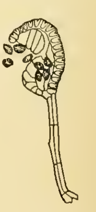
FENUGREEK (*Trigonella Fœnum-Græcum*, literally Greek hay). An annual legume indigenous to western Asia, cultivated and widely naturalized in Mediterranean countries; little grown in America. The seeds are 1 or 2 lines long, brownish yellow and marked with an oblique furrow half their length. They emit a peculiar odor, and contain starch, mucilage, a bitter extractive, a yellow coloring matter, and 6 per cent of fixed and volatile oils. As human food they are used in Egypt, mixed with wheat flour, to make bread; in India, with other condiments, to make curry powder; in Greece, either boiled or raw, as an addition to honey; in many oriental countries, to give plumpness to the female human form. The plant is used as an esculent in Hindostan; as an early fodder in Egypt, Algiers, France, and other countries bordering the Mediterranean. Formerly the seed was valued in medicine; now it is employed only in the preparation of emollient cataplasms, enemata, ointments and plasters, never internally. In veterinary practice it is still esteemed for poultices, condition powders, as a vehicle for drugs, and to diminish the nauseating and griping effects of purgatives. It is commonly used by hostlers to produce glossy coats upon their horses and to give a temporary fire and vigor; by stockmen to excite thirst and digestion in fattening animals; by manufacturers of patent stock foods as a flavoring ingredient. Fenugreek does not succeed upon clays, sands, wet or sour soils. It yields most seed upon well drained loams of medium texture and of moderate fertility; most fodder upon rich lands. For seed production, potash and phosphoric acid should be applied; for forage, nitrogenous manures. Deep plowing and thorough harrowing are essential. Ten to 20 pounds of seed should be used broadcast, or 7 to 10 pounds in drills 18 inches apart. Thinning when the plants are 2 or 3 inches tall, and clean culture throughout the season until blossoming time, are necessary for a seed crop. The crop may be mowed, dried and threshed four or five months after seeding. An average yield should be about 950 pounds an acre. As a green manure, Fenugreek is inferior to the clovers, vetches and other popular green manures of this country. It possesses the power of obtaining nitrogen from the air by means of root tubercles.

M. G. Kains.

FENZLIA. See *Gilia*

FERDINANDA eminens. See *Podachænium.*

FERN. The plants included under this name comprise an entire order, made up of several distinct families. They include plants varying in size from a hair-like, creeping stem bearing a few simple, moss-like leaves, to tall trees 40 or more feet in height, with a caudex or trunk nearly a foot in diameter. Singularly enough, the extremes in size are both found in tropical regions where most of the species abound. Most of the ordinary native species, as well as the great majority of those in cultivation, consist of an erect underground stem or rootstock with leaves, often called fronds, clustered in dense crowns, or in the cases of creeping stems with scattered leaves. The Fern plant represents the asexual phase of growth (*sporophyte*), producing its spores normally in spore cases (*sporangia*, Fig. 807), which are borne in masses (*sori*, Fig. 808) on the back or margin of the leaf, or in a few cases are grouped in spikes or panicles, or in rare cases spread in a layer over the entire under surface of the leaf. The sexual stage (*gametophyte*) develops from the germinating spore, and consists of a heart-shaped prothallus (Fig. 809), which bears the sex-organs (*archegones*, female, and *antherids*, male) on the under surface. After fertilization in the archegone, the egg develops directly into a young Fern plant (Fig. 809). Many Ferns also propagate vegetatively by runners or offsets, by bulblet-like buds, and in certain species the tips of the leaves bend over and take root, as in our common Walking-leaf (Camptosorus, which see).



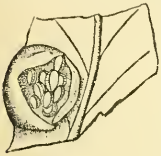
807. Sporangium or spore-case of a Fern.

Great diversity has existed in the matter of the separation of the Ferns into genera. Hooker, relying mainly on artificial characters drawn largely from the sorus, recognized only about 70 genera, many of them heterogeneous groups of plants with little resemblance in structure, habit or natural affinities. John Smith, relying on stem characters, Presl on variation in venation and habit, Fée, Moore, and others, have recognized a much

Plate XI. Ferns for various purposes

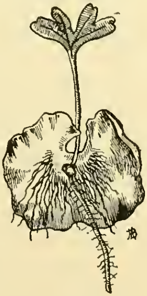
Adiantum for pots; Gymnogramma for tubs; Cinnamon fern for colonizing in parks; sprays of Boston fern for decoration

greater number of genera, ranging from 150 to 250, or even more. In the very unequal treatment by Diels in Die Natürlichen Pflanzenfamilien (Engler-Prantl), some 120 genera are recognized. A somewhat similar difference prevails in regard to the number of species. The Synopsis Filicum of Hooker and Baker (1874), supplemented by Baker's New Ferns (1892), recognizes some 2,700 species. It is the too common tendency in this work (1) to fail to recognize many valid species which have been described by German and French botanists, and (2) to mass under one name very diverse groups of species from distant quarters of the world—from 8 to 10 species not infrequently appearing as a single so-called "variable species." When we add to the number represented by these two omissions the species recently described, the number of Ferns will approximate 4,000, and possibly exceed that number. New forms are constantly coming in from the less explored parts of the world, and within the last few years several new species have been described from the United States, including some from the better known portions. Of this number some 200 species are in occasional cultivation in America, but the species that form the bulk of the Fern trade do not exceed two dozen. In Europe several hundred species have long been in cultivation. Most of the species thrive best in the insular regions of the tropics, the island of Jamaica alone furnishing 500 species and Java nearly 600. About 165 species are native in the United States, representing some 35 genera; our native species are so widely distributed that not more than from 25 to 50 will be found within the limits of one state, and the common species of the best locality do not number more than 20.



808. A sorus or fruit-dot of a Fern.

The Ferns belong to a group of spore-bearing plants, with vascular (woody) tissue in stem and leaves; this group is technically known as the Pteridophytes, and is composed of three orders; viz., the **Equisetales**, including the horsetails and scouring rushes; the **Lycopodiales**, including the selaginellas and the club mosses, or ground pines; and the **Filicales**, including the true Ferns and their nearer allies.



809. Prothallus of a Fern, with a young frond arising.

The families of the order **Filicales** may be distinguished as follows:

A. *Spores of one sort (isosporous).*

B. *Sporangia with no ring, rising from the interior tissues of the leaf. (Eusporangiate Ferns.)*

1. **Ophioglossàceæ.** Adder's-tongue Ferns. Prothallium subterranean, without chlorophyl; sporangia borne in spikes or panicles on branches distinct from the foliage leaves.

2. **Marattiàceæ.** Coarse Ferns with sporangia on the under surface of the leaf, arranged in circular or boat-shaped receptacles: prothallium above ground, green.

BB. *Sporangia rising from an epidermal cell, with an elastic ring of peculiar cells, which assist in scattering the spores by rupturing. (Leptosporangiate Ferns.)*

C. *Leaves filmy.*

3. **Hymenophyllàceæ.** Filmy Ferns. Sporangia attached to a thread-like receptacle arising in a cup at the end of the leaf: ring complete, horizontal or oblique.

CC. *Leaves more firm, herbaceous or leathery.*

D. *Ring incomplete or rudimentary: sporangia in panicles.*

4. **Osmundàceæ.** Flowering Ferns. Coarse swamp Ferns developing copious green spores early in the season: sporangia in panicles at the apex or middle of the leaf.

DD. *Ring apical: sporangia usually single under a scale, or in panicles.*

5. **Schizæàceæ.** Upright or climbing Ferns with ovate sporangia, which open vertically.

DDD. *Sporangia sessile, either single or united in clusters of 3–6.*

6. **Gleicheniàceæ.** Terrestrial Ferns with firm texture and usually dichotomous leaves: sporangia opening vertically, in clusters of 3–6.

7. **Ceratopteridàceæ.** Aquatic Ferns with succulent foliage: sporangia scattered, with a broad ring: leaves of two sorts, the sterile floating.

DDDD. *Sporangia numerous, collected in definite clusters (sori).*

8. **Cyatheàceæ.** Mostly tree Ferns with sessile or short-stalked sporangia in conspicuous receptacles, opening obliquely (Fig. 632).

9. **Polypodiàceæ.** Ferns with stalked sporangia (Fig. 807), which burst transversely: sori covered with a membranous indusium or sometimes naked. This family contains five-sixths of all the Ferns.

AA. *Spores of two sorts: minute microspores and conspicuous macrospores. (Heterosporous.) These spores develop into two sorts of prothalli, the microspores developing only antherids, and the macrospores only archegones.*

10. **Marsiliàceæ.** Small plants rooting in mud, the leaves either quadrifoliate or reduced to mere filamentous petioles: sporangia borne in oval conceptacles. Often aquatic, with the leaves floating on the surface of water in pools or lakes.

11. **Salviniàceæ.** Small or minute plants with the aspect of liver-worts, floating on the surface of pools: sporangia in mostly spherical conceptacles.

The literature on the Ferns is very extensive, since they have ever been attractive plants in cultivation. Many of the species have been illustrated in elaborate treatises by Schkuhr, Kunze, Hooker, Greville, Blume, Fée, Mettenius, Moore, and others. Our native species have been illustrated in the two quarto volumes of D. C. Eaton, "The Ferns of North America." A valuable summary of the more common Fern species is found in Dr. Christ's "Die Farnkräuter der Erde" (1897), and the most recent structural and morphological treatment is by Sadebeck, in Engler-Prantl: "Die Natürlichen Pflanzenfamilien." Schneider's "Book of Choice Ferns" is the most complete treatise on the species under cultivation. A useful American horticultural manual is Robinson's "Ferns in their Homes and Ours."

L. M. Underwood.

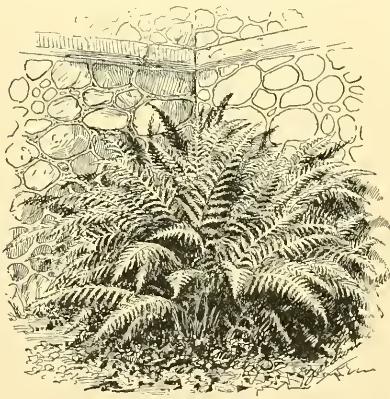
An excellent little handbook for the wild species of this country is Underwood's "Native Ferns and their Allies."

L. H. B.

Growing Hardy Ferns.—Our hardy Ferns fill a place in our North American flora very worthy of our careful study and admiration. They seem to require so little care, and yet give such general satisfaction, and there is such a variety—suited to every taste and condition—that no one need do without them. About 20 useful native kinds are evergreen, including the Oregon Cliff-brake and *Cheilanthes vestita* of the southern states. They are very easy of culture in our New England climate. About 20, like the Maidenhair, that die down through the winter but have perennial roots, are also easy to grow. In the general cultivation of these hardy Ferns, plant them in a moist, shady situation, with good drainage, and with about one-third leaf-mold. Go to nature in selecting the Ferns. Yet it is a fact that some of these Ferns, like *Woodwardia Virginica*, found growing so common in wet swamps, will thrive in our garden soil planted with *Polypodium vulgare*, which nature plants among the rocks and on great boulders well up the mountain side, thus proving to us that it is not always necessary to plant in the same situation as we find them in the wild. As a rule, we get the best results when planted in shade, yet there are some exceptions, like Dicksonia, which is such a prominent feature on our northern New England hillsides. Many dreary places shut out from the sunlight may be beautified by a clump of Ferns, and fill the place as no other plant will do. The native kinds will survive our New England winters without covering, but they are all benefited by a mulch of leaves or boughs. Be sure that the Fern border is protected from strong winds (Fig. 810). Against the shady or half-shady side of a house is a good spot, if there is no drip from the eaves. It is best to select rather young and small clumps when hunting Ferns in the wild. When once established, these will persist and thrive for years.

It is much better to move Ferns in early spring or late autumn, when not in growth; but we may wish to plant them in summer, when they are in full growth. In this latter case cut off all the new fronds: this will retard evaporation, or keep the plant from wilting. Get the roots into the soil with as little exposure to the air as possible, and (with a very few exceptions) new fronds will spring up, giving nearly as good results as if planted in early spring. No doubt a great majority of failures from planting when in full growth are due to not cutting back.

Edward Gillett.



810. Hardy Ferns against a house foundation—The Ostrich Fern.

Many species will thrive under other conditions than those in which they grow most luxuriantly in a wild state, and, in general, the species are tenacious of life wherever placed; but as the beauty of Fern foliage is brought out only by luxuriance of growth it should be the aim to plant only where such may be obtained. Ferns are exceedingly easy to transplant, and with care may be removed from native haunts during the summer, though it is always to the conservation of the strength of plants to move them when dormant. In planting Ferns, especially those of small size, the spattering of soil on the fronds by rain must be prevented by covering the earth with material such as gravel or moss for the smaller species and leaves for the more vigorous. The smaller species are easily smothered with leaves, and some of the stronger, as Dicksonia and *Aspidium Noveboracense*, do not endure coarse covering. The evergreen species should preferably be given a position shaded in winter, such as a bank with northern exposure. The best species for planting in sunlight are *Pteris aquilina*, Osmundas, Dicksonia, *Onoclea sensibilis* and *Aspidium Noveboracense*. When planting in sunlight, give a moister situation and a heavier mulch than if planting in shade. A light soil is preferable, but, except for the species with running rootstocks, is not necessary. The soil may be enriched with any manure not given to heating. For species native only of limestone soils, old plaster should be mixed with the soil. An application of any manure to Ferns growing in turf is apt to stimulate the grass to the crowding out of the Ferns.

Following are notes, drawn from experience, on the cultivation of some of the common native Ferns:

Adiantum pedatum prefers light, loose, rich soil in cool, moist shade, with yearly mulch of leaves. Soil conditions are more important than shade. Where established in a wild state will endure the full sunshine coming with the removal of trees until soil conditions change or it is crowded out by stronger plants.

Aspidium acrostichoides should be given shade both summer and winter for best results, and in no case can shade in summer be omitted. The plants will endure sunshine for a few years but will not be thrifty, and will eventually die.

Aspidium Bootti is found in a wild state in moist, shaded positions, but will grow well in shade in quite dry positions.

Aspidium cristatum prefers moist to wet soil in shade. It will not endure strong sunlight.

Aspidium Goldianum prefers deep, moist, rich soil in cool shade.

Aspidium marginale wants rich soil in rather deep shade during the entire year, but will grow well in partial shade, and endure even full sunlight, though not growing so luxuriantly.

Aspidium Noveboracense does best in rather moist, rich soil in partial shade, but will endure full sunlight with good soil conditions.

Aspidium Thelypteris prefers quite moist situations with at least partial shade.

Asplenium angustifolium thrives on rich rather moist soil in shade. Avoid complete removal of fronds when planting in early fall, as this Fern quickly sends up new fronds to the weakening of the following season's growth.

Asplenium ebeneum prefers partial shade. Care must be taken to prevent smothering by leaves and to plant where the least likely to be heaved by frost. It is found most plentifully as a native on banks growing with grass and other plants in partial shade. The fronds are evergreen, but become discolored in severe weather.

Asplenium Filix-fœmina prefers rich, moist soil in shade.

Asplenium montanum does well in continual shade.

Asplenium pinnatifidum and *A. Trichomanes* need shade during the entire year.

Camptosorus rhizophyllus in the wild state is found in cool, shaded positions not subject to excessive drought or moisture. It prefers a moist atmosphere, but this is not necessary. Avoid any covering of leaves.

Cryptogramma acrostichoides should be grown in shade. It will not endure much sun, at least not a removal to a sunny position.

Cystopteris fragilis should be planted in shade in positions where it will receive no covering of leaves. The fronds die in early August in the drier situations. It will grow in positions which become exceedingly dry in midsummer. It forces well in a coolhouse.

Dicksonia pilosiuscula prefers shady, moist situations where it does not receive any covering by falling leaves of large size. Grows well in sunshine. May be transplanted at any season, and takes kindly to heavy enrichment.

Onoclea sensibilis prefers a rich, moist soil in partial shade or full sunshine. It will also grow in shade.

Onoclea Struthiopteris should be given a rich, moist soil with at least partial shade. The fronds will "burn" in fierce sunlight.

Osmunda cinnamomea prefers moist, partially shaded situations, but will grow well in full sunshine in rich soil not exceedingly dry.

Osmunda Claytoniana, a native of low ground, both in shade and sunshine, but will grow equally well in rich soil only fairly moist.

Osmunda regalis prefers a peaty soil in very wet, boggy position in partial shade, but will grow as well in full sunshine if soil is rich and not dry.

Pellæa atropurpurea prefers rather dry positions in partial shade, winter and summer, with soil not deficient in lime. It will not endure heavy mulching. Will grow in full sunshine, but not to its full size. It may be transplanted at any season.

Phegopteris Dryopteris prefers good soil in shade not over moist or dry. Avoid coating of leaves. It is a beautiful species and useful for planting on rockwork in shade. The fronds die in August.

Phegopteris hexagonoptera needs good soil in shade. Fronds die down rather early.

Phegopteris polypodioides prefers moist, shaded positions, but will grow in any good soil not too dry. The fronds die down in late summer, especially in the drier positions.

Polypodium vulgare prefers good, light soil in well drained but moist situations in shade, with no other plants growing with it. It will endure very dry places, but will be dwarfed. Will also do well in full sunlight if soil conditions are good. As a native it grows in positions where it does not receive any yearly coating of fallen leaves, and, wherever planted, should not be covered with coarse material. Plant perfectly evergreen; height 6–10 in.

Pteris aquilina, to be grown to perfection, should have considerable sunlight, with moist, rich soil, kept cool and loose with a coating of leaves or other material. In such a position it should grow 4–5 ft. high, with other dimensions corresponding. However, it will grow in almost any position. Although easy to transplant, it is likely to do poorly until established. It has strong, creeping rootstocks, so that attention is necessary to keep a healthy group within bounds. The earliest fronds put forth die in late summer, but those of later growth remain green until frost, so that with attention to the removal of dead fronds a group will look well until fall.

Woodwardia angustifolia wants a moist situation in deep shade. Does well in moist peat north of a bank or wall. Will endure full sunlight in positions where it has become established, but will not grow well when transplanted to sunny position. F. W. BARCLAY.

CULTURE OF TENDER FERNS.—To grow commercial varieties of Ferns profitably, the first care should be to secure the necessary number of properly built and equipped houses, with a conveniently arranged workshop. The house which gives the most general satisfaction runs north and south. Have an even-span roof, with a fall to roof of 6 inches to the foot. Its benches should be arranged to be about 7 feet wide, with a 24-inch path on either side. In an 18-foot house this will permit of having a 7-foot center table, two 3½-foot side benches and two 24-inch paths. Benches should not be more than 3 feet above the walks, as this will bring every part of the bench within easy reach, and will permit of every plant being in constant sight and easily cared for, which fact is essential in the profitable cultivation of trade Ferns.

The width of house is immaterial, but when houses adjoin, a width of 27 feet has been found to be very satisfactory, as this permits the construction of three 7-foot benches, two 24-inch paths, and two paths 2½ feet wide under each gutter.

Thorough provision should be made for ventilation. For a 27-foot house, a continuous row of ventilators of at least 3 feet in width should be provided, with some reliable apparatus for raising same. Heating is the next important consideration. Either steam or hot water will give equally good results if properly installed. The safest way for the average grower is to give the heating contract to some reliable firm. Water taps should be so arranged that a 25-foot hose attached to same will easily reach any part of the house. A 25-foot hose can easily be carried about without injuring either itself or benches and plants; and iron pipe is of only half the cost of good hose. In most Fern houses drip is a source of great annoyance, and should be prevented by the use of drip-bars, by having a drip-groove plowed into the headers immediately under the ventilating sash, and also by having a groove in sides of gutter plates. This very slight additional expense will very soon pay for itself by saving a great number of plants, especially when growing very small Ferns in houses, such as have been transplanted from spore-pots into boxes. Ventilators should fit into a groove in ridge of house and be hinged to the ridge. When ventilators are so arranged, air, which is very desirable on a good many warm, rainy days in the summer, can be given without having plants in the houses suffering from excessive moisture. Burning of the foliage will also be avoided, as the plants will at no time be exposed to the direct rays of the sun. Ventilators hinged on header and opening on ridge will always give trouble. No matter what kind of covering is put over the opening, if it efficiently excludes the burning sun's rays it will also prevent the ingress of air.

Propagating room should be provided for; and in the case of general trade Ferns raised from spores, it is a very safe rule to calculate on having from 60 to 70 square inches of room in the propagating frame for every 1,000 plants desired. The propagating frame should be 3½ feet wide, have sides 9 inches high, and, to insure an even moisture, its bottom should be covered to the thickness of 1 inch with fine cinders with the fine ashes removed, which make very clean and efficient drainage material. The frame should be covered with light sash constructed with drip-bars, to carry off condensation.

Shading of Fern houses should have close attention. It is best effected by the application of a suitable wash to the outside of glass on roof. The following composition for a wash has given excellent results for a number of years: To 2 gallons of benzine or turpentine add 1 pint (or more, according to time the shading is desired to remain on houses) of linseed oil, 5 pounds of pure white lead and enough whitening to make proper thickness (which can very easily be ascertained by applying some of it to a piece of glass while adding the whitening); thoroughly mix and apply to outside of glass with a soft brush of the same width as glass. This shading, by the addition of more or less linseed oil, may be made to stay on houses up to one year. If properly applied in spring, it will be just right during the hot days of summer, and in the fall and winter, when more light is gradually required, the frosts gradually will have reduced the shading, thus admitting more light at the necessary time.

Much time, annoyance and expense will be saved by a careful arrangement of the workshop, or potting room, a thing which in most cases is totally neglected. It should be so built that potting benches are about 3 feet above the floor and 5 feet wide. They may be permanently constructed of substantial material, in order that a number of pots of different sizes can be conveniently stored, and that potting material can be thrown from cart or wagon directly onto potting benches. By an improper arrangement of workshop great expense, loss of time and material are incurred by having to handle material repeatedly in small quantities.

Propagation by Means of Spores.—To grow Ferns from spores successfully, it is advisable to sterilize soil on which spores are to be sown, which can best be done by subjecting it to a high temperature by means of steam under a pressure of from 10 to 15 pounds; and for this purpose a properly equipped workshop should be provided with a tight box about 3 by 3 by 8 feet or larger if an uncommonly large number of Ferns is to be grown. It should be fitted with a grating made of 2-inch laths spaced one inch apart and placed 2 inches from bottom of the box. This grating may be covered with burlap, and if a ¾-inch steam pipe is fitted between bottom of box and grating, and connected to highest point of steam boiler (to insure getting perfectly dry steam) we are ready to sterilize the soil. After having cooled off, the soil is in practically the same condition as before as far as moisture, friableness, etc., are concerned, and this cannot be said of soil that has been sterilized by burning and by other methods. This steaming process will effectually destroy all forms of life in the soil and leave it for the use of spores alone. In most localities, the water used for moistening spores is impure and full of the spores of low forms of plant life, which are very destructive to the prothalli of Ferns. To prevent this, the workshop should be provided with a receptacle in which the water intended for use on Ferns while in the prothallus state can be raised to a boiling temperature, which will effectually destroy all spores that may be present in the water. This is best done by leading a 1-inch steam pipe to within 6 inches of the bottom of the receptacle and turning on a reasonable pressure of steam. If boiled 12 hours before intended for use, it will be cool enough to be applied, and will be pure. A Fern workshop should also be provided with a dry closet, having a number of shelves about 12 inches apart, for storing Fern spores.

In beginning the cultivation of Ferns, it is advisable to purchase the spores from some reliable firm which makes Fern-growing a specialty, until a sufficient number of stock plants can be grown to supply spores for home demand. Spores will do about equally well in pots or pans. Pans 12 inches square and 4 inches deep are used for that purpose, as also are the 6-inch common flower pots. The 12-inch pans should be supplied with 1½ inches and the 6-inch pots with 3 inches of coal cinders for drainage. Soil for sowing spores on is best composed of five parts, in the proportions of two parts good garden soil, two parts of finely screened peat and one of sharp, clean propagating sand. Leaf-mold may be used instead of peat, if easier to procure. This soil should be thoroughly sterilized, as already directed. The spore pots should be filled with the soil to within ¼-inch of the top; press firmly. The rest of the pots should be filled with the same composition after it has been passed through a screen of about ⅛-inch mesh, then made absolutely level, firmly pressed and thoroughly watered with sterilized water. Three or four hours after watering will be the best time to sow spores. The spores should be thinly scattered over the surface of the soil, a quantity that can be held on a surface of one-fourth of a square inch being abundant to sow one 12-inch pan. Spores should not be covered with soil. Immediately after sowing, the sash of the propagating frame should be tightly closed and kept so until spores show signs of germination, when a small quantity of air should be given and gradually increased, so that by the time the first small fronds have made their appearance they may have been sufficiently hardened off to have the sash removed entirely. In sowing spores, great care will be necessary to prevent them from getting mixed, Fern spores being very minute and so light that the slightest movement of air will carry them long distances. While sowing spores, all spore pots should be kept tightly covered. Being kept in a very close and humid atmosphere after sowing, the spores should not require any watering for one or two weeks, by which time they will have sufficiently settled not to be dislodged by a very gentle overhead watering, which should be given whenever soil shows the least sign of being dry. Sterilized water should be used until after the first fronds have been formed. As soon as the first little fronds have made their appearance, care should be taken to weed out all undesirable varieties, which, even with the very best of care, will occasionally creep in. A temperature of 65° F. should be maintained in the propagating house.

811. A Fern pan.

As soon as the first little fronds are evenly formed all over the surface of the pot, the little plants should be transferred in clumps of four or five plants each, to well drained pans (Fig. 811) or boxes filled with soil composed of one-half rich garden soil and one-half peat or leaf-mold, finely screened. In transplanting, great care should be exercised not to cover the remaining prothalli, but to have them just level with the surface of the soil. The clumps of plants should be kept as loose as possible, as this will give each individual plantlet a better chance to form the necessary number of rootlets, and it will, later on, also be easier to separate the plants. Boxes for transplanting Ferns are most convenient when 4 inches deep, 14 inches wide and 22 inches long. These boxes will hold about 200 plants placed about one inch apart. As soon as the little plants have formed two or three fronds each, they should be separated and transplanted singly into boxes similarly prepared as before, where they may remain until sufficiently strong to be potted into 2- or 2¼-inch pots.

Times of sowing Fern spores are the first weeks of March, July and October. When making three sowings a year, and allowing a sufficiently longer time for slower growing varieties, a constant supply of plants will be assured. In calculating on time of sowing spores of commercial varieties of Ferns, it will be helpful to divide them into two classes, as some varieties are considerably slower of growth and will consequently have to be sown earlier, in order to be ready for sale at the same time as the more rapid-growing ones. The following popular commercial varieties will require from 9 to 10 months between times of sowing and potting. The names are those which the plants bear in the trade:

Adiantum cuneatum,
" " variegatum,
" " grandiceps,
" Bausei,
" decorum,
" Fergusonii,
" gracillimum,
" mundulum,
" tenerum,
" Wiegandii,
Cibotium Schiedii,
" regale,
Cyathea medullaris,
Cyrtomium caryotoideum,
" Fortunii.
" falcatum,
Davallia tenuifolia stricta,
" " Veitchiana,
Dicksonia (Balantium) antarctica,
Doodia aspera,
Doodia aspera multifida,
" caudata,
Doryopteris nobilis
Lastrea aristata,
" " variegata,
" chrysoloba,
" opaca,
" Sieboldii.
Lygodium Japonicum,
" scandens,
Nephrodium hirtipes,
Nephrolepis exaltata,
" cordata compacta,
Platyloma Bridgesii,
" falcata,
Polypodium aureum,
" fraxinifolium, etc.,
Polystichum coriaceum,
" setosum,
Pteris Victoriæ,
" Tremula Smithiana.

The following trade varieties will develop into plants large enough to be potted in about six months after sowing spores:

Adiantum pubescens,
" hispidulum,
Alsophila australis,
Gymnogramma calomelanos,
" chrysophylla,
" decomposita,
" Peruviana,
" sulphurea,
Lomaria ciliata,
" gibba,
" " platyptera,
Nephrodium immersum cristatum,
Nephrodium molle corymbiferum,
Onychium Japonicum,
Pteris argyræa,
" Cretica albo-lineata,
" " magnifica,
" " Mayii,
" " nobilis,
" hastata,
" " adiantoides,
" internata,
" Sieboldii,
" leptophylla,
" Ouvrardii,
" palmata,
" serrulata,
" " cristata,
" " " nana,
" Tremula.
" Wimsettii.

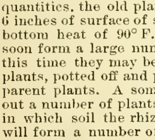
It should also be borne in mind, when calculating time of sowing, that spores sown in the autumn will require about four weeks longer for development than those sown at other times of the year.

Fern spores are borne on the back or under side of fronds. In some cases they are borne naked on under surface of frond, while in others they are produced under a scale-like membrane or indusium. In some cases, as in Pteris, the edge of the pinnæ is folded back over the spores, while in Adiantums a small part of the leaflet is folded back over each little fruit-dot to serve as a shield or indusium. Davallias form a small sack-like receptacle at the extremity of the pinnæ. The proper time of gathering spores is when they assume a light brown, rather dry appearance, or in the indusium-bearing kinds when the indusium or shield begins to open. Spores should be gathered on a dark day when the fronds are slightly moist, as they will be better retained in that condition, and will not be so liable to get mixed when disturbed. Fronds, or parts of them, should be cut off entirely in most cases, put up in tight paper bags and stored on shelves in a dry closet for a week, by which time, in most cases, they will be sufficiently dry to have spores removed from them by rubbing the frond in a sieve which has about 20 meshes to the inch. When thus separated from fronds the spores should be put up in small seed-bags and placed in air-tight jars until required for sowing. Cared for in this manner, perfect success has been invariably secured, even after keeping spores for years.

Propagation by Other Means.—Some Ferns form little plants at the ends of pinnæ and of fronds, which upon attaining to sufficient size may be detached from parent plants, planted into shallow, well-drained seed-pans, and for a week or two left in the propagating frame, where they will soon form roots, when they can be potted. Among such are *Adiantum caudatum*, *A. Edgeworthii*, *A. lunulatum*, var. *dolabriforme*, *Asplenium Belangerii*, *A. bulbiferum*, *A. salicifolium*, *Gymnogramma schizophylla*, var. *gloriosa*, *Polystichum angulare*, var. *proliferum*, and many more.

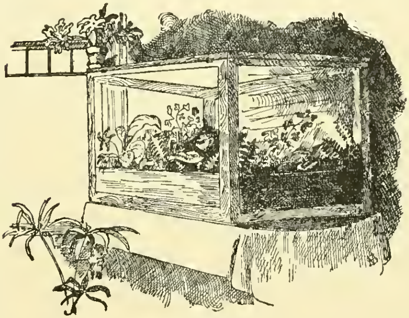
A very useful decorative Fern is *Nephrolepis davallioides*, var. *furcans*, and it will make a beautiful specimen plant in a comparatively short time. To grow large quantities, the old plants should be cut back to within 6 inches of surface of soil and placed in a house where a bottom heat of 90° F. may be secured, when they will soon form a large number of short, strong fronds. At this time they may be divided into a number of small plants, potted off and placed in the same position as the parent plants. A somewhat slower method is to plant out a number of plants on a bench into 5 inches of soil, in which soil the rhizomes, running over the surface, will form a number of small plants, which may be detached and grown on.

A beautiful Fern is *Adiantum Farleyense*, and it deservedly ranks as the greatest favorite among Fern-lovers. It is best propagated by division. From old plants, cut off all fronds down to the rhizomes, wash off soil, cut rhizomes into pieces ½-inch long, insert same into well-drained Fern boxes about ½-inch apart, in 1½ inches of clean, sharp propagating sand. Place same in propagating frame in a temperature of 70° F. In this position each little fragment of rhizome will form two or three little fronds in about 15 or 20 days, when they may be potted off singly into 2-inch pots and kept in a temperature of 70° F. The soil best adapted to *A. Farleyense* is finely chopped sod which has been piled for about six months, with one-fifth well decomposed cow manure added. To attain perfection in growth and coloring, *A. Farleyense* should be kept in a light, airy and sunny house, in which every condition of moisture and atmosphere can be kept under absolute control. In a house of this kind, the greatly admired and beautifully pinkish tint may be easily obtained and fronds will be hardy and of good substance. A temperature of 70° F. is at all times desirable.


812. A good specimen.

General Remarks on Fern-growing.—To grow Ferns such as are used for jardinieres and decorative work (Fig. 812), and mentioned in the two preceding lists, a temperature of no less than 55° F. should be maintained at all times at night in coldest weather, with a rise of temperature in the daytime of 10 or 15°. To keep Ferns in a healthy and growing condition, to prevent and to kill insect pests and diseases, a proper condition of atmosphere should be carefully maintained at all times. Extremes in heat, moisture or dryness should never be allowed. On a warm, dry, sunny day, when a great deal of air has to be admitted, much of the moisture of the house is consequently carried off; it will be of great benefit then to syringe the Ferns once or twice a day, also to occasionally dampen floor of houses. An excessively dry atmosphere induces the development of the very troublesome pests, thrips and red spider. On damp and rainy days a saturated atmosphere should be prevented by supplying a little artificial heat, even if some air has to be admitted at the same time. This slight expense of heating on damp days will abundantly pay for itself by causing the growth of strong, thrifty plants. An excessively moist atmosphere causes parts of fronds of a great many plants to turn black and to rot off, besides inducing the development of almost incurable fungoid diseases.

In the selection and growing of stock plants, the careful grower should always be on the watch for types which are most perfect in shape, in character of individual fronds, in coloring, freedom of producing spores, and exemption from the attacks of insects and fungous diseases. In a large number of Ferns a great difference between the different plants of the same species will be apparent to the careful observer. Some plants of same species have beautifully developed fronds, but are carried on long, weak stems, which makes them unfit for general use. Others may be of compact, sturdy habit of growth, but with poorly shaped individual fronds. In some individuals the coloring will be greatly superior. By closely studying all these points and by continually selecting only the most perfect types of Ferns from the young plants, we can in a few years work up a very desirable and superior stock. The same stock plants of the rapid-growing varieties of Ferns should not be carried over for more than three or four years, but young and more desirable plants should continually be selected and grown to take their places.


813. A home-made Fern case.

The stock should be shifted into larger pots whenever necessary, and placed in a light, airy house, in which all necessary conditions are under perfect control, and in which a temperature in coldest weather of 55° F. at night, with a rise of 10 or 15° in daytime, can always be maintained. The house should be shaded just enough to prevent fronds from turning yellow. Proper attention to atmospheric conditions of stock-house should never be neglected. Stock plants should not be permitted to remain pot-bound for too long a period of time, except with a few varieties, such, for instance, as Alsophilas, Dicksonias, Cyatheas, Cibotiums, *Pteris Tremula*, *P. argyræa*, some Davallias, *Polystichum coriaceum*, etc., which, if given too much nourishment, will often be very slow in setting spores.

Insects which are most troublesome to Ferns are thrips, red spider, scale and mealy bug. They are mainly present in a too dry atmosphere. Thrips, red spider and mealy bug are easily prevented by a properly moistened atmosphere, also by spraying of foliage once a week with tobacco water. As tobacco greatly varies in strength, every grower will have to determine to his own satisfaction how strong to make his solution. The preparation known as "Rose-leaf tobacco extract," has proved very efficient in destroying these insect pests. To 50 gallons of water add one quart of the extract, and apply with some good insecticide sprayer and a force pump. Fifty gallons of this solution will be enough to spray 100,000 Ferns in 2¼-inch pots.

Bearing in mind the foregoing advice, the amateur Fern-grower may determine the proper way in which to raise his plants. He may not have a Fern house, but he can have a tight glass box or Wardian case (Fig. 813).

The bottom should be a zinc tray, to prevent drip on the floor and to prevent too rapid drying out of the soil. The top or roof of the box should be hinged, so that it can be raised. In this miniature greenhouse many interesting Ferns can be grown. Lycopodiums and Selaginellas (which see) are treated in much the same way as Ferns. NICHOL N. BRUCKNER.

GROWING FERNS FROM SPORES BY THE AMATEUR.—Ferns may be raised from spores at almost any season of the year, though the early spring months are best. The shallow pans 2 in. deep by 6 in diameter, now sold by pot manufacturers, we have found, after repeated trials, best to sow Fern spores in. These should be filled to within half an inch of the top with a mixture of sifted peat, leaf-mold and silver sand in equal proportions, the surface being made very fine and even. By sowing the spores thinly we have found that they are not as liable to the attacks of fungus during the prothallus stage. They should not be covered with soil, as in sowing seeds. Each pan should be placed in a pot-saucer, and all the water necessary to keep the soil moist should be poured into the saucer and allowed to soak up through the soil. This not only prevents the spores being floated into clusters, but probably filters the water of any germs of low forms of vegetable life which might prove injurious to the spores during germination. After the prothallus stage is passed this precaution is unnecessary; as soon as the young Ferns begin to develop fronds, they may be watered freely overhead with a fine rose. The pans should be placed in a temperature of 65° to 75°, in a shaded position. Each pan should be covered with a pane of glass to keep the surface evenly moist, taking care to remove the moisture which collects on the glass at least twice daily; but as soon as the spores have germinated, which, in most cases will be in about ten days, these should be gradually removed. A close watch must be kept for fungus during the prothallus stage, and if a pan should show the least sign of it, it should at once be isolated from the rest and a little fine sulphur dusted upon it; if this fails to check it the prothalli should be at once transplanted to fresh pans of soil, which usually checks it. The chief reasons for fungus are sowing the spores too thickly, a too stagnant atmosphere after germination, and a dripping greenhouse roof. As soon as the young Ferns begin to make fronds, they may be transplanted. EDWARD J. CANNING.

FERN BALLS are the dried rhizomes of Ferns, imported from Japan. Dealers start them into growth, and sell them when the mass is well covered with its delicate vegetation. To start them into growth, the balls are drenched in a tub of water and then hung in a warmhouse, not in direct sunlight. When the plants are well started, gradually expose them to more light and to a cooler air. Give liquid manure if they do not grow satisfactorily. The species are mostly Davallias, oftenest apparently *D. bullata* and *D. Mariesii*. L. H. B.

FERNS, POPULAR NAMES OF. **Adder's Tongue F.**, *Ophioglossum vulgatum*. **Beech F.**, *Phegopteris*. **Bird's-nest F.**, *Thamnopteris Nidus-Avis*. **Bladder F.**, *Cystopteris*. **Boston F.**, *Nephrolepis exaltata*, var. *Bostoniensis*. **Bristle F.**, *Trichomanes*. **Buckler F.**, *Dryopteris*. **Californian Gold F.**, *Gymnogramma triangularis*. **Chain F.**, *Woodwardia*. **Christmas F.**, *Polystichum acrostichoides*. **Cinnamon F.**, *Osmunda cinnamomea*. **Climbing F.**, *Lygodium*. **Deer F.**, *Lomaria*. **Elk's Horn F.**, *Platycerium alcicorne*. **Female F.**, *Asplenium Filix-fœmina*. **Filmy F.**, *Hymenophyllum*. **Floating F.**, *Ceratopteris*. **Flowering F.**, *Osmunda*; sometimes also *Anemia*. **Gold F.**, *Gymnogramma*. **Grape F.**, *Botrychium*. **Hart's-tongue F.**, *Phyllitis Scolopendrium*. **Hartford F.**, *Lygodium palmatum*. **Holly F.**, *Polystichum Lonchitis*. **Lace F.**, *Cheilanthes gracillima*. **Lady F.**, *Asplenium Filix-fœmina*. **Lip F.**, *Cheilanthes*. **Maidenhair F.**, *Adiantum*; more particularly *A. Capillus-Veneris* abroad and *A. pedatum* at home. **Male F.**, *Dryopteris Filix-mas*. **Marsh F.**, *Dryopteris Thelypteris*. **Oak F.**, *Phegopteris Dryopteris*. **Ostrich F.**, *Matteuccia Struthiopteris*. **Pod F.**, *Ceratopteris thalictroides*. **Rattlesnake F.**, *Botrychium Virginianum*. **Royal F.**, *Osmunda regalis*. **Sensitive F.**, *Onoclea sensibilis*. **Shield F.**, *Dryopteris*. **Stag-horn F.** See *Platycerium*. **Sun F.**, *Phegopteris*. **Sweet F.**, *Myrica asplenifolia*; abroad, various *Dryopteris*. **Sword F.**, *Nephrolepis exaltata*. **Venus' Hair F.**, *Adiantum Capillus-Veneris*. **Walking F.**, *Camptosorus rhizophyllus*. **Wall F.**, *Polypodium vulgare*. **Wall-rue**, *Asplenium Ruta-muraria*. **Washington F.**, *Nephrolepis exaltata*, var. *Washingtoniensis*.

FERRÀRIA (Giovanni Battisti Ferrari, 1584–1653, Italian Jesuit, botanical writer and collaborator with the celebrated artist Guido Reni). *Iridàceæ*. There are 7 species, all from the Cape of Good Hope, rarely growing more than 6 in. high. They have a large, irregular corm and very glaucous foliage, the lowest lvs. being long and linear, the rest ovate, clasping, successively smaller, and topped by inflated sheaths from which emerge the oddest fls. imaginable. These have 6 triangular, spreading, crisped, petal-like lobes, wonderfully marked with many dull colors, as yellow, green, purple and brown. Each spathe contains several fls., and the fls. are united at the very base, connivent and cup-shaped below the spreading lobes. The fls. last only from morning to afternoon of a single day, but there is a fair succession. Some are visited by carrion flies. Only one species, *F. undulata*, is advertised at present, but the other 6 are doubtless of equal interest. The first is the oldest kind in cult. It was known to pre-Linnæan authors as *Flos Indicus* and *Gladiolus Indicus*. E. S. Miller writes that the bulbs should be stored like Gladiolus in a dry, warm place, away from mice.

A. *Fls. dull brownish purple.*

undulàta, Linn. Stem stout, erect: upper lvs. and spathes 1½–2 in. long: fls. 2 in. across, largely dull purple; anthers oblong, with parallel cells. B.M. 144.

AA. *Fls, greenish.*

uncinàta, Sweet. Lvs. 2–3, linear: fls. 2, "cream colored, edged with sage green," according to W. E. Endicott.

AAA. *Fls. dark purple.*

atràta, Lodd. Lvs. about 4, sword shaped: fls. 3–4.

Other names are advertised by Dutch bulb growers, but are not to be found in Index Kewensis or Flora Capensis: *F. Canariensis, cœlestis, conchiflora, grandiflora, immaculata, liliacea* and *rosea*. These can perhaps be accounted for under Tigridia, where *F. Pavonia* belongs. W. M.

FERTILITY of soils: that condition of soils which makes them productive. The elements of productivity are, a full supply of available plant-food, a suitable and continuous supply of moisture, good physical conditions of the soil, coupled with suitable seed and climate.

Land may contain vast quantities of potential nitrogen, potash and phosphoric acid and other plant-food, and yet be unfruitful,—infertile. Most of the potential plant-food in the soil is lazy, not available in sufficient quantities in a single season to produce maximum crops. Average arable land which contains from 3,000–4,000 pounds of nitrogen, an equal amount of phosphoric acid and four times as much potash in the first 8 inches of an acre, may produce only 15 bushels of wheat per acre, which requires, with the straw, but 24, 13 and 20 pounds of these three elements respectively. Therefore, land may contain a great abundance of potential plant-food and yet not contain enough of that which is available for a full crop. To make land more fertile, one or more of the following means may be employed. Usually deeper and more thorough tillage should first be resorted to, since most lands, by reason of careless farming, contain much inert plant-food. Superior tillage is almost certain to produce fruitfulness, and therefore should be resorted to before more expensive methods are tried. Tillage not only makes plant-food more available, but it improves the physical conditions of the soil, thereby making it more comfortable for the plant; it may also assist in relieving the land of surplus water, and give to the soil the power of retaining large stores of moisture by capillary action.

Moisture plays such an important part in productiveness that it may be said to constitute its prime factor. Clay soils are usually composed of such fine particles that water percolates through them slowly or not at all. The rainfall then must either run off over the surface, or remain to be evaporated. The aim should be to so prepare the land by subdrainage, plowing and surface tillage, and by introducing at least one crop of tap-rooted plants in the rotation, that the surplus water will filter through the soil in a reasonable time. Percolation of rainwater through soils makes them more friable and warmer in spring, aërates the land, promotes beneficial biological and chemical changes, and brings to the soil the nitrogenous compounds contained in the rainwater. Soils which are reasonably porous have the power of retaining more moisture, and of giving it up to plants when needed to a greater extent, than either open sandy or close clay soils do. Fertility, which results in fruitfulness, is governed very largely by the water and moisture conditions of the soil, and these, in turn, are largely governed by the texture of the land and the amount of humus which it contains.

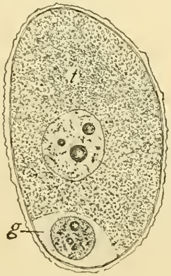
Legumes, used either as a harvest or cover-crop, promote fertility. A cover-crop of clovers planted August 1, and analyzed 64 days after planting, contained of nitrogen, in roots and tops, per acre as follows:

	Tops Lbs.	*Roots* Lbs.	*Total* Lbs.
Crimson clover	125	30	155
Red clover	63	40	103
Mammoth clover	67	78	145

Clovers and other legumes may be used to fix and store up the uncombined nitrogen of the air and to digest and make available the mineral constituents of the land, thereby greatly increasing the fertility of the soil.

Barn manures, when properly cared for and intelligently applied, not only furnish acceptable plant-food but humus as well. Fertility and high productivity usually may be maintained many years by means of superior tillage, leguminous harvest and cover-crops, and the manures of the farm. In some cases a high state of fertility can be maintained only by occasional applications of commercial mineral fertilizers, as phosphates and potash, but too often expensive fertilizers have been substituted for tillage, leguminous plants and barn manures.

Fertility may frequently be promoted by light applications (20 to 30 bushels per acre) of quick lime. Lime may serve to make plant-food more available, improve soil texture and correct acidity. Its use is especially recommended on clay and moist lands and in orchards where the ground is much shaded. Applications of gypsum and salt are sometimes beneficial in maintaining fertility, but they, as well as lime, usually act indirectly, as the soil is seldom deficient in these constituents so far as they are required as plant-food. On high-priced lands, especially those devoted to horticulture, the soil should be made and kept fertile—well up to its highest productive power.



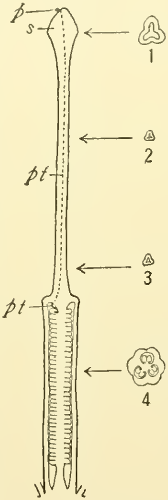
814. A pollen grain of Lilium Philadelphicum.

Before leaving anther, seen in section; *t*, the tube cell; *g*, the generative cell. The large spherical body in each cell is the nucleus. Magnified 500 diameters.

Sometimes soils are rendered unfruitful by the presence of deleterious substances, as organic acids or alkaline salts, or a superabundance of some one or more of its usually useful ingredients, as water or nitrogenous matter. An excess of nitrogen stimulates the growth of stalk and straw at the expense of grain, or in the orchard it tends to the formation of wood rather than to fruitfulness. The acidity should be corrected by lime, as noted above, the surplus water removed by drainage, the nitrogenous matter reduced by the production of such crops as are not harmfully affected by its superabundance, such as forage crops which are prized for their foliage rather than for their seeds, while the alkalinity may sometimes be overcome by deep tillage or irrigation.

I. P. ROBERTS.

FERTILIZATION. The union of two sex-cells, a male cell and a female cell, to form a new one capable of growing into a plant. The term was formerly used to include the transfer of pollen to the stigma (e. g., Darwin's "On the Fertilization of Orchids by Insects"), but this process is now generally distinguished as *Pollination*, which see. In the lower plants, fertilization can be much more readily observed than in the seed plants, because in the latter it takes place inside of opaque parts, and therefore can be studied only by the most careful microscopical methods. The process of fertilization is here described as it occurs in lilies. In other seed plants it differs in details.



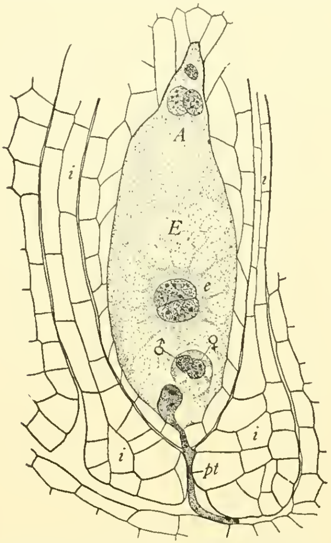
815. Outline of a pistil of Lilium Philadelphicum.

Cut lengthwise almost through the center; *s*, stigma on which pollen grain, *p*, has been lodged. The course of the pollen tube, *pt*, is indicated by broken line. At the right, 1, 2, 3, 4, are cross sections of the pistil at the levels indicated by the arrows: 1, the stigma; 2, 3, the style, show the triangular canal which leads into the three chambers of 4, the ovary, in each chamber of which are two rows of ovules. Natural size.

The generative cell (*g*, Fig. 814) is produced by the pollen grain before it leaves the anther. It is usually lenticular, and placed at one end of the grain. Its most important part is the spherical nucleus, which occupies the center. When the pollen grain is conveyed to the stigma (*s*, Fig. 815), the larger cell (*t*, Fig. 814), nourished by food it absorbs from the stigma, grows, forming a long tube (*pt*, Fig. 815), which traverses the narrow triangular canal (1, 2, 3, Fig. 815) that leads down the long style to the ovary. In many plants the style is not hollow. In this case, and often when it has a canal, the pollen tube pushes its way between the cells of the style, living on the food it absorbs. About the time the tube begins to grow (or later) the generative cell divides into two. These male cells, or sperms, migrate down the tube (*pt*, Fig. 815), which makes its way into the opening between the inner integument (*i*, Fig. 816) of the ovule, penetrates the body of the ovule and enters the embryo-sac (*E*, Fig. 816). Its direction of growth is determined by substances, probably chiefly the sugars, contained in the parts which it traverses.

While the pollen tube has been growing, the female cell has been forming in the embryo-sac (*E*, Fig. 816). The nucleus of this huge cell, originally single, has divided into two, these into four, and these into eight nuclei, four migrating to each end. Then one from each group advances toward the middle of the sac and the two fuse into one (*e*, Fig. 816). One group of three (sometimes after dividing again and again, sometimes only the original three) may organize cells at the antipodal end of the embryo sac (*A*, Fig. 816). In the lilies, however, this does not go far, and two of the three antipodal nuclei are seen to be already reduced in size and partially disorganized. They have no further history. The group of three nearest the point of entrance of pollen tube accumulate the living protoplasm about them and thus organize three naked cells. Two of these (called synergidæ) usually begin to disorganize before the pollen tube reaches them, but may persist until then or even later. In the lilies they usually disappear early. The third is the *egg*, or oösphere. When the pollen tube enters the embryo-sac, its end becomes softened and bursts, permitting one or both of the male cells to migrate from it. One male nucleus

(♂, Fig. 816) fuses with the nucleus of the egg (♀, Fig. 816), and fertilization is complete. The other, heretofore supposed to be disorganized, is now said to fuse with the endosperm nucleus (*e*, Fig. 816). The fertilized egg begins at once to grow and forms the embryo, while the endosperm nucleus divides and forms cells in which food may be stored for the embryo when it resumes growth at the time of germination.



816. Part of an ovule of Lilium Philadelphicum.

Cut lengthwise; *i*, *i*, inner integument, enclosing, except at a narrow orifice where the pollen tube, *pt*, enters, the body of the ovule, which is chiefly occupied by the large embryo sac *E*. *A*, antipodal end of embryo sac with three nuclei, one much disorganized. *e*, the endosperm nucleus, just being formed by fusion of two nuclei from the respective ends of the embryo sac. ♂, male nucleus, which has just migrated from pollen tube and is about to fuse with ♀, the egg nucleus. The synergidæ have disappeared. Magnified 670 diameters.

CHARLES REID BARNES.

FERTILIZERS. There is one fact that has been fairly well established by experiment and inquiry, namely, that fruits, flowers and vegetables are benefited by the intelligent application of manures and fertilizers, and that, in the majority of cases, such application is followed by profit. In the first place, these crops should be classified for purposes of fertilization according to their period of growth, the first class including the perennial fruits and flowers, and the second, the annual flowers and vegetables. Those of the first class differ from ordinary crops in that a longer season of preparation is required, during which time the growth is vegetative rather than productive, though upon this vegetative growth depends the quality and value of the fruit or flower obtained. The growth of both tree and fruit is dependent, too, not only upon the food acquired during its year of growth, but also upon that previously acquired, and which has been stored up in bud and branches.

The tree fruits include apples, pears, peaches, plums, cherries, apricots, etc. It may be regarded as a safe assumption that the fertility elements, phosphoric acid, potash and lime, contribute materially to the proper growth and hardening of the wood, as well as the maturation of the fruit. The necessity for added nitrogen is, on the whole, much less; it should be applied as the need for it appears in the lack of vigor of the tree.

In the next place, it is safe to assume that the materials which furnish these elements or constituents in slowly available forms are liable to be quite as useful, except under special conditions, as those which are quickly available, because the tree growing continuously, though slowly, is able to obtain from the gradually dissolving substances a sufficient amount for its daily needs. Hence, as a rule, fertilizers for fruit trees may include the less available and cheaper forms of constituents.

APPLES AND PEARS.—On soils of good natural character, the fertilization of apples and pears need not begin until the trees reach the bearing period, when an annual dressing of 400 pounds per acre of either of the following mixtures should be applied in early spring, and plowed in:

No. 1.—One part, or 100 pounds each, of ground bone, acid phosphate and muriate of potash.

No. 2.—One and one-half parts, or 150 pounds, of ground bone, and one part, or 100 pounds, of muriate of potash.

As the trees grow older, these dressings should be increased. While no definite rules can be laid down as to the most profitable amounts to apply, the best growers find that for mature trees it pays to use from 1,000 to 1,500 pounds annually. In many cases nitrogen, in addition to that contained in the mixture, should be used, the kind and form depending, perhaps, upon the relative cost more than upon any other one thing, the minimum amount to be 20 pounds per acre, or an equivalent of 125 pounds of nitrate of soda. In many cases it is possible to obtain the necessary nitrogen from the growing of leguminous crops, as crimson clover and red clover, though when these are used they should be plowed down early in the spring, in order that their growth may not interfere with the growth of the tree. If they are allowed to remain until mature, they absorb not only the food that may be necessary for the growth of tree and fruit, but the moisture also, and thus they frequently injure rather than improve the crop prospects. On poor soils, the necessity for fertilization is naturally greater. In fact, on these liberal fertilization —500 pounds per acre—should precede the setting of the trees, and be continued annually. On these soils, too, green manuring, as a source of nitrogen, can be practiced with safety for a longer period than in the preceding case.

PEACHES.—Peaches differ from apples and pears in respect to fertilizing. The demands for added plant-food are proportionately greater in the early life of the tree, and are different because of their more rapid growth, their early bearing, and the exhaustive character of the crops. On soils of good natural character, however, the necessity for fertilizing is seldom apparent until after the first or second year of growth. That is, good soils will provide sufficient food for a normal development of leaf and wood, and any additional fertilization would have the tendency to unduly increase the tree growth. On medium and poor soils, the setting of the trees should be preceded by a fertilization, preferably broadcast in spring, and plowed in, with one or the other of the mixtures recommended for apples and pears, as follows:

No. 1.—One part, or 100 pounds each, of ground bone, acid phosphate and muriate of potash.

No. 2.—One and one-half parts, or 150 pounds, of ground bone and one part, or 100 pounds, of muriate of potash.

On the better soils, No. 2, and on the poorer, No. 1, at the rate of 400 to 600 pounds per acre, which should be followed by the application of the more soluble fertilizers, immediately the trees begin to bear. The need of nitrogen is often very marked, and is shown by a lack of vigor of the tree. Nitrate of soda applied broadcast in early spring has proved a very valuable form of nitrogen, since it is appropriated by the roots during the early season, and if a sufficient abundance of the minerals is present, it enables a normal development of leaf and branch. If the quick-acting nitrogenous fertilizers are applied late, or if too large applications of the slower-acting nitrogenous materials are applied early, the tendency is to provide for a continuous feeding on nitrogen, and thus encourage an undue development of leaf and branch, which does not permit the ripening of the wood before the beginning of winter. Thus, on these soils, in addition to an annual application of the basic formula, from 100 to 150 pounds of nitrate of soda, 200 pounds of acid phosphate and 100 pounds of muriate of potash should be applied early in the season and carefully worked into the soil.

PLUMS, CHERRIES AND APRICOTS.—The fertilizing of these fruits, when grown on the different classes of soils, need not differ materially from that recommended for peaches under the same conditions, though cherries, particularly, require, in addition, a relatively greater supply of lime, which should be applied at the rate of 30 bushels per acre once in about five years, and thoroughly incorporated with the soil.

SMALL FRUITS AND BERRIES.—These, in respect to their general character, correspond more nearly with the vegetable crops than with the cereal grains or fruits, hence, in most cases, natural sources of plant-food are ignored, and the more quickly available materials, particularly nitrogenous and phosphatic, applied.

In the case of strawberries, it is desirable that the soil in which the plants are set should be supplied with soluble and available phosphoric acid; hence an application, broadcast previous to setting, of from 500 to 800 pounds per acre of the mixture No. 1, is recommended. The nitrogen should also be in quickly available forms, and should be supplied in sufficient quantities at time of setting the plant to enable it to mature, and thus to better withstand the rigors of winter. Hence, an additional application of 100 pounds of dried blood, or its equivalent in nitrate of soda or ammonia, is advisable, particularly on soils not previously well enriched with organic nitrogenous matter. In the spring of the season during which the first crop is harvested, dressing with a quick-acting fertilizer, rich in nitrogen, is desirable, carefully applied between the rows, and preferably worked into the soil.

Raspberries and blackberries also require a soil well enriched with the mineral elements, to insure an abundant and strong growth of canes. The need for nitrogen, while apparent, is less marked than in the case of the strawberries, and the slower-acting forms serve a good purpose, provided they are not applied in too great quantities, so as to encourage a large growth of plant, which does not fully mature. An annual application of mixture No. 2 is recommended at the rate of 400 to 600 pounds per acre.

Currants and gooseberries are less likely to need nitrogen than the other berry crops, because of the tendency to the development of mildew. In common with the other crops mentioned, they should be abundantly supplied with the minerals (phosphoric acid and potash), and mixture No. 1 may be used at the rate of 500 to 1,000 pounds per acre.

GRAPES.—Grapes are more exhaustive than most of the fruit crops, largely because of the larger total crop harvested, and the special need is for phosphoric acid and potash. These elements may be supplied by mixtures No. 1 or No. 2, and very liberal dressings are recommended—from 800 to 1,500 pounds per acre annually—after the bearing period begins.

ROSES AND OTHER FLOWERING PLANTS.—In the growing of flowers and herbaceous plants, phosphoric acid is particularly needed, and it has been demonstrated that ground bone is one of the most useful forms from which to obtain it, since it furnishes both nitrogen and phosphoric acid in slowly available forms. A good mixture for both the field and prepared soils may consist of four parts of ground bone and one of muriate of potash, applied at the rate of four pounds per square rod, and preferably worked into the soil previous to setting the plants; the after application may be made in the fall at the same rate.

VEGETABLE CROPS.—Vegetables constitute a group of plants distinguished from all others, both because of their peculiar habits and of their purposes of growth. Both having an important bearing upon fertilization, they should all be supplied with an abundance of available food. Since nitrogen is the one element that more than any other stimulates leaf and stem growth, its use is extremely beneficial for all of these crops, and because of their relatively high commercial value the quantity of fertilizer may be greatly in excess of that for the other groups. While a classification of these crops is possible, a fertilizer of the following composition may be regarded as a basic mixture for the entire group:

Nitrogen	4%
Phosphoric acid	8%
Potash	10%

The nitrogen should be derived in part from quickly available sources, and the phosphoric acid should be all soluble or available, and the potash from muriate. This should be applied in part broadcast, and in part in the row at time of planting, at the rate of 1,000 to 1,500 pounds per acre, and upon soils naturally poor, two or three additional annual top-dressings with nitrate of soda, at the rate of from 50 to 100 pounds per acre, will prove very serviceable. EDWARD B. VOORHEES.

FÉRULA (possibly the stems were anciently used as ferules). *Umbelliferæ.* GIANT FENNEL. This large genus includes 2 hardy herbs, which are, perhaps, the tallest plants cult. for ornament in this large (but from the garden standpoint unimportant) order. They are valued for the excessive fineness with which their foliage is cut, and their clusters of perhaps 40–50 umbels of minute yellow fls. borne on stout stems, which rise far above the foliage. **F. Tingitàna**, Linn., from N. Africa, has lvs. 4 times ternately pinnatisect, somewhat glaucous. B.M. 7267. The common error that it comes from Spain goes back to Morison, 1680. Lindley originated the false notion that this plant is the source of gum ammoniac. **F. commùnis**, Linn., from S. Eu., has deep green lvs., with more linear segments and more compact habit. W. M.

FESSENDEN, THOMAS GREEN, editor and author, 1771–1837, founded "The New England Farmer" at Boston in 1822, and edited it until his death. The present "New England Farmer" is not the lineal successor of Fessenden's paper. Fessenden is chiefly noted as a satirical poet, and he was more of a literary man than a gardener. He was born at Walpole, N. H., was graduated at Dartmouth College in 1796, and studied law. He went to England in 1803, and there published his humorous poem, the "Terrible Tractoration." He settled in Boston about 1804. In addition to "The New England Farmer," he edited the short-lived "Horticultural Register," and "The Silk Manual." He wrote "The Complete Farmer and Rural Economist," "The New American Gardener," and "The American Kitchen Gardener," three books of a cyclopedic nature designed to cover the fields of agriculture, horticulture and vegetable gardening respectively. They adhered very closely to the contemporaneous English type of horticultural writing. These books profess to have passed through many editions, but they were little altered from issue to issue. They often seem to lack the enthusiasm of direct contact with growing plants. Fessenden's time was one of general farming, and the view-point of gardening was mostly that of the home or amateur. He lived before the days of specialized farming on a large scale, and of commercial horticulture and floriculture. During the greater part of his editorship of "The New England Farmer" there was but one other important American agricultural paper, "The American Farmer," which was published at Baltimore, beginning 1819. The most important contemporaneous American writings on horticulture of a cyclopedic nature were "The American Gardener's Calendar," by Bernard M'Mahon, Philadelphia, 1806, and "The American Gardener" of John Gardiner and David Hepburn, Georgetown, D. C., 1804. For a copy of "The Country Lovers," Fessenden's once famous song to the tune of Yankee Doodle, together with Hawthorne's pen-picture of the man, and an account of his interesting life, see Duyckinck, Cyc. Am. Lit. 1:595–599.

W. M.

FESTÙCA (an ancient name of uncertain meaning). *Gramìneæ.* FESCUE GRASS. Usually cespitose, perennial grasses of varying habit. Lvs. rather dry, harsh, and usually narrow. Spikelets several, in dense or loose and spreading panicles; empty glumes unequal, mostly keeled; flowering-glumes not keeled, pointed. Species about 80, in all parts of the world. They are essentially permanent pasture grasses, but some are useful for lawns and ornamental purposes.

glaùca, Lam. (*Festùca ovìna*, var. *glaùca*, Hack.). BLUE FESCUE GRASS. A handsome, tufted, hardy perennial grass, with deep, silvery blue leaves resembling the common Sheep's Fescue (*Festuca ovina*), and by most authors regarded as a variety of it. Lvs. very narrow, conduplicate: panicle somewhat one-sided and short: spikelets 3–8-fld., with a short awn.—An attractive plant for edgings or for contrast of foliage with deeper colored plants. Often used also in hanging-baskets, window-boxes and the rockery. It will grow almost anywhere if not too densely shaded. Propagated by division of the tufts.

amethýstina, Host. (*F. ovìna*, var. *psammóphila*, Hack.). A very pretty grass with violet-colored culm and sheaths: lvs. somewhat thin and long, blue-green: panicles slightly branched, small, often violet-colored: spikelets short-awned, seldom awnless. Europe.—Useful as an ornamental grass in the garden for dry, sunny places. Propagated by division.

Various Fescues are used in pastures and in lawn grass mixtures. *F. duriúscula*, Linn. (Festuca ovina, var. duriuscula, Hack.). A slender, densely tufted perennial grass, 1–2 ft. high: lvs. very fine, radical, closely resembling Sheep's Fescue. Panicle open. Eu. Thrives on dry, sandy soils unfit for the growth of better grasses. It possesses some value as a lawn grass, but if used for this purpose should be sown thickly and unmixed with other grasses.—*F. heterophýlla*, Lam. A rather slender perennial European grass, 2–4 ft. high: lvs. of two distinct forms, the radical ones 3-nerved, narrow, hairy and folded together; those on the culms much broader, flat, and 5–7-ribbed: panicle large, open and nodding at the apex. Eu. It is an excellent grass for woodland parks, where it is too shady for the successful growth of other lawn grasses.

P. B. KENNEDY.

FETTICUS. Another name for *Corn Salad.*

FEVERBUSH. See *Benzoin.*

FEVERFEW. *Chrysanthemum Parthenium.*

FEVER TREE is *Pinckneya pubens.*

FEVERWORT. *Triosteum.*

FIBER PLANTS are treated only incidentally in this work. Division of Publications, U. S. Department of Agriculture, Washington, D. C., issues free publications of the Office of Fiber Investigations.

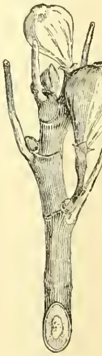
FÌCUS (ancient Latin name). *Urticàceæ.* The Fig, the India Rubber Plant, the Banyan Tree and the Creeping Fig of conservatory walls belong to this vast and natural genus, which has over 600 species scattered through the warmer regions of the world. Ficus has no near ally of garden value. It is a genus of trees or shrubs and climbers, with milky juice. In the common Fig the lvs. are deeply lobed, but in most of the other species they are entire or else the margin is wavy or has a few teeth or an occasional small lobe. The lvs. are nearly always alternate, *F. hispida* being the only species of those described below which has opposite lvs. The foliage in Ficus varies all the way from leathery to membranous, and is astonishingly variable in venation, so that the veins are very helpful in telling the species apart. What the horticulturist calls the Fig, or fruit, is the fleshy receptacle, while the fruit of the botanist is the seed inside (Fig. 817). In the following account fruit is used instead of receptacle.

The fertilization or caprification of the Fig is one of the most surprising, interesting and complicated chapters in natural history, and is of great practical importance. See *Fig*, where the culture of *F. Carica* is discussed.

The most important ornamental plant in the genus is the India Rubber Plant (*F. elastica*), which probably ranks amongst the 25 most popular foliage plants for home use indoors. Its culture is given below at length. This is one of the most important rubber-producing plants. See *Rubber Plants.*

The Creeping Fig (*F. pumila*, better known as *repens* or *stipulata*), is one of the commonest and best climbers for covering conservatory walls. It clings close and makes a dense mat of foliage, which is about as dark in color as the English ivy. The plant has been cult. since 1771, but within the last quarter century has come to be recognized as the best plant there is for its special purpose. Once in a long while it fruits in conservatories, and the fruiting branches are very unlike the barren ones. They stand out from the conservatory wall instead of lying flat and close. The lvs. of the barren branches are less than an inch long and heart-shaped, with one side longer than the other at the base and a very short petiole; the lvs. of fruiting branches are 2–3 inches long, elliptic-oblong, narrowed at the base, and with a petiole sometimes half an inch long.

Among the many wonders of the genus Ficus are the epiphytal habit of some, the huge spread of the Banyan Tree (*F. Benghalensis*), and the fact that some species ripen their fruits under ground. Some of the tallest tropical trees are members of this genus, and often they begin life by climbing upon other trees. The Ficus often overtops and outlives the other tree, which may be seen in every stage of decay, or may have entirely disappeared, leaving the giant climber twined spirally around a great hollow cylinder. The Banyan Tree sends down some of its branches (or aërial roots) into the soil, these take root, make new trunks, and eventually produce a great forest, in which it is impossible to tell the original trunk. The Banyan in the botanic gardens at Calcutta sprung from a seed probably dropped by a passing bird into the crown of a date palm a little more than a century ago. The main trunk is now 42 ft. in circumference; there are 232 additional trunks, many of them 8–10 ft. in circumference, and the branches extend over an area 850 ft. in circumference, forming a dense evergreen canopy through which sunlight never penetrates. The Banyan under which Alexander camped, and which is said to have sheltered 7,000 men, now measures 2,000 ft. in circumference and has 3,000 trunks. Other species have the same method of propagation, but *F. Benghalensis* is the most famous.



817. Young Figs. Showing how they arise from the axils of the leaves.

The various species of Ficus are cultivated for fruit, for ornament in greenhouses, and for shade outdoors in the extreme South, as indicated in the key by A, AA, and AAA. The shade trees are procurable from southern Florida and southern California.

Index of names (synonyms in italic):

aurea, 18.
australis, 7.
Benghalensis, 20.
Carica, 1
elastica, 2 and 14.
erecta, 3.
glomerata, 11.
hispida, 10.
Indica, 19.
infectoria, 12.
macrocarpa, 4.
macrophylla, 15.
minima, 8.
nitida, 17.
oppositifolia, 10.
Palmeri, 16.
Parcelli, 6.
pumila, 8.
quercifolia, 5.
radicans, 9.
religiosa, 21.
repens, 8.
retusa, 17.
rubiginosa, 7 and 13.
stipulata, 8.

A. *Cult. for fruit.*

1. **Càrica,** Linn. Figs. 817, 821, 822. Height 15–30 ft.: lvs. 3–5-lobed, the lobes more or less wavy-margined or lobed, and with palmate veins, whereas nearly all species mentioned below are pinnately veined: fr. single, axillary, pear-shaped. Supposed to be a native of Caria, in Asia Minor. Makes a fine pot-plant, and fruits freely in northern conservatories. For culture, see *Fig.*

AA. *Cult. indoors for ornament, hence not tall trees under these conditions.*

B. *Habit erect, not climbing.*

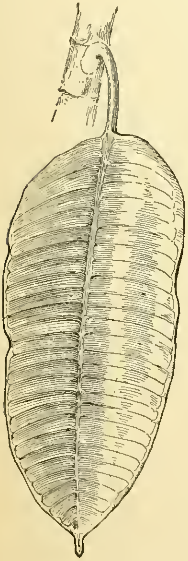
C. *Under surface of lvs. not rusty.*

D. *Foliage not variegated (except in a variety of No. 2).*

E. *Lvs. entire or with margins wavy, not lobed.*

F. *Nerves numerous, 50 pairs or so.*

2. **elástica**, Roxb. INDIA RUBBER PLANT. Figs. 818, 820. Lvs. 3–12 in. long, shining, leathery, oblong to elliptic, with an abrupt, dull point; nerves parallel, running at nearly right angles from midrib to margin: fr. in pairs, sessile, in axils of fallen lvs., covered at first by a hooded involucre, when ripe greenish yellow, ½ in. long. Damp forests of trop. Asia. G.F. 2:547.—Becomes 100 ft. high in tropics, but becomes unsightly under glass at 8 or 10 ft. Cult. plants mostly have a single stem, but there is a growing demand for compact and branching plants. Var. **variegàta** (var. *aurea*, Hort.) is much less popular. Lvs. creamy white or yellow near the edges. J. D. Eisele says it is liable to fungous diseases. This species is also grown South as a shade tree. The nervation is very characteristic. So, also, is the handsome rosy sheath which incloses the young lvs., and which soon drops off. This is regarded as a stipule of exceptionally great size.



818. Leaf of Rubber Plant, showing venation. F. elastica (×¼).

FF. *Nerves about 8 pairs.*

3. **erécta**, Thunb. Extraordinarily variable: shrub to small tree, glabrous, pubescent, or almost strigose: lvs. broadly ovate, obovate or elliptic (lanceolate in var. Sieboldii), entire or with here and there a lobe, or rather coarsely dentate above the middle: fr. single or in pairs, peduncled or subsessile, and either globose and not stalked or pear-shaped and long-stalked. Himalayas. China, Japan. B.M. 7550 (where the lvs. look rather leathery). Procurable through dealers in Japanese plants.

FFF. *Nerves about 3 pairs.*

4. **macrocárpa**, Wight. Becomes a large, climbing tree: lvs. 5 in. long, membranous, broadly ovate; petiole 2–2½ in. long: fr. 1–2½ in. thick, spotted, globose, in cauline clusters. India.—This name was once adv. by John Saul, who spoke of the plant as a shrub with leathery lvs.

EE. *Lvs. deeply lobed, not merely wavy.*

5. **quercifòlia**, Roxb. The oak-leaved form is the typical one, but King includes *F. humilis*, Roxb., in which the lvs. are serrate or nearly entire and not lobed. Lvs. 2–5 in. long, "thickly membranous;" nerves 5–7-pairs; petiole ½–1 in. long: fr. in axillary pairs, egg- or pea-shaped. Burma, Malaya, where it is a shrub, often creeping or decumbent. L.B.C. 16:1540 (fruiting soon after importation, when 2 ft. high). Adv. 1895 by Pitcher and Manda. Voss refers this, with many other synonyms, to *F. heterophylla*.

DD. *Foliage variegated.*

6. **Parcélli**, Veitch. Lvs. thin, membranous, light green, mottled with cream-white, more or less in the manner of mosaic, oblong-oval, acuminate, dentate. Islands of Pacific. F.S. 22:2273. F.M. 1874:124.—Int. by Veitch about 1874. A warmhouse shrubby plant; probably the most popular of the variegated forms of Ficus. J. D. Eisele says it is readily prop. by cuttings of half-ripened wood placed in sand in brisk bottom heat Also cult. in S. Calif., where it bears tricolored fr.

CC. *Under surface of young lvs. rusty.*

7. **rubiginòsa**, Desf. (*F. austràlis*, Willd.). Lvs. leathery, rounded or cordate at base, notched at tip: fr. mostly in pairs, globular, 5–6 lines thick, usually warty. Australia, where it throws out aërial roots like the Banyan Tree. B.M. 2939.—The rusty color is a beautiful feature. Voss considers this a form of *F. elastica*.

BB. *Habit climbing or trailing.*

C. *Form of lvs. ovate, obtuse, unequally heart-shaped at base.*

8. **pùmila**, Linn. (*F. stipulàta*, Thunb. *F. rèpens*, Hort., not Rottl.). CREEPING FIG. Fig. 819. Prostrate or climbing shrub, clinging close to conservatory walls and then flattened. Lvs. more or less 2-ranked, on very short petioles, ovate, obtuse, entire or slightly wavy, rounded or cordate at the base, often unequally; veins prominent below. Japan, China, Australia. B.M. 6657. R.H. 1891:448. G.C. II. 14:560, 561, 717. Var. **mínima** (*F. mínima*, Hort.) has smaller lvs. The species is sometimes used for hanging baskets.

CC. *Form of lvs. oblong-acuminate, slightly notched at base.*

9. **radicans**, Desf. Garden plant, with green, oblong-acuminate lvs. and trailing habit. Imperfectly known. Habitat unknown. Var. **variegàta**, Hort. W. Bull., has lvs. irregularly marked with creamy white, the variegation beginning at the margin. G.C. III. 22:185. A.G. 19:527. Int. 1897.

AAA. *Cult. outdoors in southern Fla. and Calif. for shade, etc., hence often tall trees.*

B. *Arrangement of lvs. usually opposite.*

10. **híspida**, Linn. f. (*F. oppositifòlia*, Willd.). Shrub or small tree: lvs. entire or toothed: fr. clustered on old wood or leafy branches, hispid, yellowish. Asia. Trop. Australia.

BB. *Arrangement of lvs. alternate.*

C. *Texture of lvs. membranous, not leathery.*

D. *Lvs. tapering to a point; base entire, obtuse.*

11. **glomeràta**, Roxb. CLUSTER FIG. Lvs. 4–7 in. long; nerves 4–6 pairs: fr. clustered on leafless, scaly branches, pear- or top-shaped, 1¼ in. thick, reddish. India, Burma.—"A quick-growing, evergreen shade tree."—*Reasoner*. "A dense shade tree: lvs. have a peculiar metallic luster: small fruits, much relished by cattle and children."—*Franceschi*.

DD. *Lvs. with an abrupt, short, acuminate apex; base notched.*

12. **infectòria**, Roxb. Lvs. 3½–5 in. long; nerves 5–7 pairs: fr. in axillary pairs, sessile, globose, ¼ in. thick, whitish, flushed and dotted. Trop. Asia, Malaya.—Grows 60 ft. high, and is one of the best shade trees.

CC. *Texture of lvs. leathery, not membranous.*

D. *Under surface of lvs. rusty.*

13. **rubiginòsa**, Desf. Described at No. 7.

DD. *Under surface of lvs. not rusty.*

E. *Stipules very large, rosy, inclosing the young lvs. when young and falling off afterwards.*

14. **elastica**, Roxb. Described at No. 2.

15. **macrophýlla**, Desf. MORETON BAY FIG. Lvs. 6–10 in. long, 3–4 in. wide: stipules 2–4 in. long: fr. nearly globular, 9–12 lines thick, axillary, in 3's or 4's, on short, thick peduncles. Austral.—Much planted in southern and middle California, where, however, it does not perfect seed. F. von Mueller says it is perhaps the grandest of Australian avenue trees.

EE. *Stipules not exceptionally large and not rosy or deciduous.*

F. *Young lvs. densely covered with wool beneath.*

16. **Pàlmeri,** Watson. Tree, 8–12 ft. high, branching near the ground: lvs. 3 in. long, 2–2½ in. wide; petiole 1 in. long: fr. in pairs, axillary, globose, ½ in. thick. Discovered on San Pedro Martin Island, northwestern Mexico, 1887.—Perhaps the best adapted to severely hot and dry places. Franceschi says it attains 30 ft.

FF. *Young lvs. not woolly.*

G. *Base of lvs. narrowed.*

H. *Stipules glabrous.*

17. **retùsa,** Linn. (*F. nítida*, Thunb., and Hort., not Blume). Lvs. 2–4 in. long; nerves 5 or 6 pairs; petiole 3-6 lines long: fr. sessile, in pairs, axillary, 4 lines thick, yellow or reddish. Trop. Asia, Malaya.—A large evergreen tree with a few aërial roots.

18. **aùrea,** Nutt. Branches pale, smooth, furrowed: lvs. 3–4 in. long, smooth, oblong, entire, narrowed but obtuse at each end, stout-petioled: fr. orange-yellow, globose, 4 lines thick. S. Fla.—Reasoner says it is a handsome decorative plant for the florist, and that it grows 60 ft. high. Chapman describes it as a small tree; he says nothing about stipules. Tender in Santa Barbara.

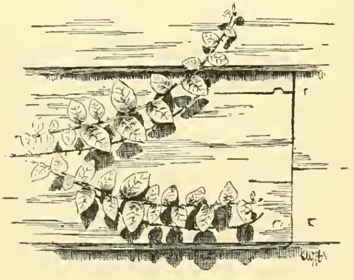
HH. *Stipules not glabrous.*

19. **Índica,** Linn. Not the Banyan Tree. Glabrous throughout, except stipules: lvs. 4–7 in. long; nerves about 4–6 pairs, not very prominent; petiole 4–12 lines long; stipules 6–9 lines long: fr. in crowded pairs, sessile, globose, smooth, yellowish red, 4 lines thick. Trop. Asia, Malaya.—This species is greatly confused in botanical literature with *F. Benghalensis*, but *F. Indica* does not take root from its branches, as does the Banyan Tree. In recent writings *F. Indica* is often given as a synonym of *F. Benghalensis*, but the distinctions here given are those made by King, in Flora British India 5: 499 (1890). Tree grows 50 ft. high.

GG. *Base of lvs. rounded.*

H. *Nerves about 5 pairs: lvs. 4–8 in. long.*

20. **Benghalénsis,** Linn. BANYAN TREE. Also written *Bengalensis*. Young parts softly pubescent: nerves prominent; petiole 6–18 lines long; stipules 9–12 lines long: fr. in pairs, sessile, globose, puberulous, red, about the size of a small cherry. Trop. Africa, India.—A tree, 70–100 ft. high, rooting from the branches, thus forming accessory trunks and extending the growth of the tree indefinitely. For an explanation of the confusion between Benghalensis and Indica, see Hooker's Flora Brit. India 5:499, 500.



819. The Creeping Fig on a conservatory wall.
Ficus pumila, better known as *F. repens* or *F. stipulata.*

HH. *Nerves about 8 pairs: lvs. 4½–7 × 3–4½ in. long.*

21. **religiòsa,** Linn. PEEPUL TREE of the Hindoos. Petiole 3–4 in. long; stipules minute: fr. in axillary pairs, sessile, dark purple, ½ in. thick. India. Gn. 1, p. 435.—Grows 100 ft. high, and the lvs., suspended on their long, flexible petioles, rustle in the slightest breeze.

F. Afzèlii, G. Don, is a plant from S. Afr., never described by Don. The plant in the trade is said to be F. eriobotroides. Once advertised for indoor ornament by Pitcher & Manda.—*F. carnòsa*, Hort. Advertised 1895 by Pitcher & Manda for indoors.—*F. Chauvièrii*, Hort. In Europe this is said to be second only to F. elastica. Franceschi says it has broader and more oval lvs., and comes from New Caledonia, where it attains 60 ft. J. D. Eisele says that it has oval lvs. with creamy white veins, is strong-growing, and should be valuable for subtropical gardening.—*F. Coòperi*, Hort., is cult. indoors from trop. Amer. Advertised 1895 by Pitcher & Manda.—*F. Cùnninghami* is a new species of great size, producing aërial roots; introduced by California Experiment Station, and recommended by Reasoner Bros. for house culture in the South. Presumably from Austral.—*F. eriobotroìdes*, Kunth & Bouché. Habitat unknown. See F. Afzelii.—*F. falcàta*, Miq., is cult. but not advertised. A creeper with lvs. often of 2 forms, leathery, tesselately dotted and colored beneath. It is a form of F. punctata, with lvs. oblong or subrhomboid, obtuse, not tapering below. India. Before No. 8 in the key.—*F. lùcida*, Dryand. From India, but not described in Flora of British India. Advertised 1893 by John Saul for indoors.—*F. prínceps*, Kunth & Bouché. Braz. Cult. by Franceschi, who says it grows 60 ft. high and has magnificent foliage, which is bronze and copper-colored when young.—*F. pyrifòlia* may be F. Benjamina, erecta, Fontanesii or rubra. The name is advertised by Yokohama Nursery Co., who also advertise F. erecta.

W. M.

FICUS ELASTICA, or the Rubber Plant as it is known all over this country, is perhaps the most popular and satisfactory house plant that has ever been cultivated. It is a plant for the million. Some florists have several houses especially devoted to the propagation and cultivation of this tough and thrifty plant. There are also thousands upon thousands of young plants or rooted cuttings from thumb-pots imported into this country, especially from Belgium and Holland, for marketing every spring. It is estimated that from 75,000 to 80,000 Rubber Plants were sold in America during the last year. There are several varieties of the Rubber Plant, but the true *Ficus elastica* is the best, both for growing and for selling. It can be easily told from the smaller-leaved variety, which is smaller and lighter colored in all its parts, the stem being smoother, and the sheath that covers the young leaves lacking the brown tint, which often runs into a bright and beautiful Indian red.

The method of propagating now popular in America employs old, bushy stock-plants, either in pots or tubs, or planted out into a bed where the night temperature can be kept from 60° to 75° F. As soon as the young shoots are 5–6 in. long they are operated upon. An incision is made at the place where it is intended to root the young plant, cutting upward on a slant midway between two eyes, making the cut anywhere from 1–2 in. long, according to the thickness and length of the young shoot or branch. A small wedge, as a piece of match, is then inserted to keep the cut open. A large handful of clean, damp, well prepared moss is then placed around the branch to cover the cut and is tied moderately firm with twine or raffia. Some use a small piece of charcoal for a wedge in the cut; others coat the two cuts with a mixture of charcoal dust and lime. The latter practice, in the opinion of the writer, is beneficial in that it expedites the callusing of the cuts and the rooting of the young plant after being cut and mossed. The moss should be kept constantly moist, and the higher the temperature, within reasonable limits, the quicker the rooting process goes on. The roots of the young plant usually appear on the outside of the oval-shaped bunch of moss. A complete cut can then be made below the moss and the young plant potted. The smaller the pot at first the better. The leaves of the young plants should be tied up in order that they may not be injured by coming in contact with one another or by lying flat on the pots. The young plants now require a gentle bottom heat and frequent syringing,—a dozen times on clear days. As soon as the young plants are taken from the stock-plant, a little wax should be put on the end of the cut to prevent the milky sap from escaping. The best time of the year to propagate and root Ficus is from the first of January to May. The European growers never start much before the Christmas holidays; and from then until spring they make all their cuttings.

The older method of propagating Rubber Plants is still the favorite one abroad; it employs single-eye cuttings. Sometimes, if the branches are very thick, only one-half the stem is taken with the eye and a single leaf, the leaf being curled up and tied with raffia, and the small piece with the eye set into the propagating bed. This is a bed of sharp sand, or sometimes of sand and chopped sphagnum moss or fine cocoa-fiber. Frequently the single-eye cuttings are put at once into the smallest sized thumb-pot, with a mixture of very finely ground potsherd and charcoal filling about one-half the pot, and either soil or sand for the balance. A small stick is used to hold the leaf upright. These pots are plunged into the propagating benches in either sand, moss or fiber, and a steady bottom heat of from 75° to 80° is applied and kept up until the plants are rooted. As a rule, such beds are inclosed in a glasshouse, in order to keep about them close, warm and moist atmosphere. Only ventilation enough to permit the moisture caused by the evaporation to escape is allowed on these beds. In this country, propagation by the first described method can be continued nearly all the year round. From experience of both methods, the writer can say that the top-cutting and mossing process is better by far, especially where plenty of stock plants can be maintained.

820. Ficus elastica, the Rubber Plant of florists.

After being shifted from the smaller sized pots into 3- or 4-in. pots, the young plants will stand a great deal of liquid manure as soon as they are rooted through or become somewhat pot-bound. Many propagators plant out the young plants from 3- and 4-in. pots into coldframes after the middle of May, or when all danger of night frost is past. They do very well in the bright, hot, open sun, but must receive plenty of water. After being planted out in frames, they should be potted not later than September, and for early marketing as early as in August. The plan of planting out and potting in the later part of summer or early autumn is a very practicable one, as the plants do not suffer so much from the severe heat during the summer. H. A. Siebrecht.

Within recent years a much-branched or tree-shaped style of Rubber Plant has attained a considerable degree of popularity. It is possible to produce such a plant by topping it at any desired height while it is in a free growing condition. However, the best shaped plants are obtained only by natural branching. In order to induce Rubber Plants to branch freely without the intervention of topping, it is necessary to keep the plants dry and cool for two or three months in the spring, in order to get them thoroughly rested. Then plant them in a frame or in open ground that has been highly fertilized, and give plenty of water. When the plants start into growth they will be inclined to "break;" that is, to make branches from the axils of many of the leaves all along the stem. By this method handsome, tree-shaped specimens of the Rubber Plant may be secured by the following autumn. W. K. Harris.

FIG is *Ficus Carica*, a native of Asia. See *Ficus*. It is a warm-temperate fruit, although it will stand 10 to 20 degrees of frost under favorable conditions. It was early introduced into North America, but excepting on the Pacific coast it has never been more than an amateur fruit. It has been known to fruit in the open in Michigan without other protection than a high board fence inclosure, but usually if grown north of Philadelphia the plants are lifted in early November, with good balls of earth, kept in a dryish cellar over winter, and planted out the next spring. From Philadelphia to the Carolinas they may be bent to the ground and covered with earth or pine boughs. The fruit is borne on the young wood, and often on young trees. This fruit is really a hollow pear-shaped receptacle with many minute seeds (botanically fruits) on the inside; it grows like a branch from the side of the shoot. Inferior, run-wild forms are frequent in the southern states, where they are sometimes called "old man and woman" by the negroes. Figs may be grown under glass, being planted permanently in a border after the manner of hothouse grapes. They usually bear better if the branches are trained more or less horizontally. Two or more crops may be expected in one year under glass. Eastern nurserymen sell Fig trees. As early as 1833 Kenrick ("New American Orchardist") described 23 varieties. Popular varieties for amateur cultivation in the east are Turkey, White Genoa, Black and Brown Ischia. In order to facilitate the ripening of the fruit in cool climates or under glass, it is a custom to dress the surface of the nearly full grown Figs with sweet oil. As a dessert fruit Figs are usually eaten in the fresh state, in which condition they are scarcely known to people in cool climates. They are also cooked. The commercial Fig is the dried fruit.

The Fig is propagated very easily from hardwood cuttings, as grapes are. Take cuttings in the fall, cutting just below a bud. If wood is scarce, single-eye cuttings may be used, being started preferably in a frame. From cuttings, bearing plants may be expected in 2 to 4 years. New varieties are obtained from seeds.

Various fruit books give directions for the growing of Figs. Publications in California and of the United States Department of Agriculture discuss them. But the only independent American writing seems to be James T. Worthington's "Manual of Fig Culture in the Northern and Middle States," Chillicothe, Ohio, 1869. Although regularly copyrighted, it is a pamphlet of only 10 pages. It recommends the laying-down of the trees in late fall and covering them with earth. This practice gave better results than covering with other material, or carrying the trees over winter in cellars, either in tubs or transplanted from the open.

Incident to the commercial cultivation of Figs in California, there has been much discussion of the necessity of caprification or fertilization by means of the Fig wasp. The necessity for caprification, as well as the nature of the process, was first established by Dr. Gustav Eisen; see "Biological Studies on Figs, Caprifigs and Caprification" (Proc. Cal. Acad. Sci. Ser. 2, Vol. V. 1896). In this paper Dr. Eisen demonstrates for the first time that there are three distinct classes of edible Figs, those which here have been termed Smyrniaca, Hortensis and Intermedia, and that some of these required caprification and others not. Another point established by him was that caprification was entirely a process of pollination, and not due to the sting of the Fig insects, as had been previously held by certain investigators. In this and other Fig work, the United States Department of Agriculture has taken an active part. Dr. Howard, U. S. Entomologist, has done much towards introducing the wasp. As early as 1890, H. E. Van Deman, then U. S. Pomologist, introduced a few cuttings of the Smyrna Fig and large quantities of the Capri, and these were distributed in the Fig-growing sections of the country. The Smyrna Fig was first hand-pollinated in 1891 by

Dr. Eisen at Niles, Calif. The wasp was introduced several times without success, but the Department of Agriculture took hold of the matter in 1898, and in 1899 succeeded in establishing the insect (sent from Algeria by Mr. Swingle) in Mr. Roeding's orchard at Fresno, Calif.

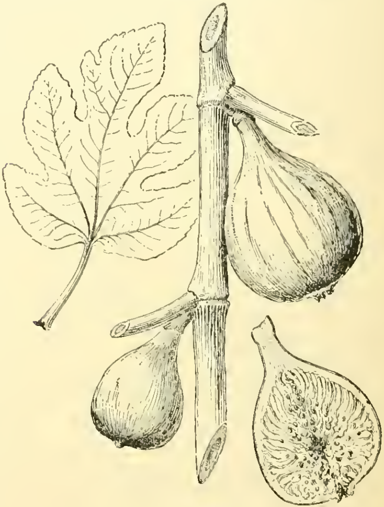
For further notes on Figs, see Bulletin No. 5, Division of Pomology, U. S. Dept. of Agric., by Gustav Eisen (1897), Bulletin 20, new series, Division of Entomology, Dept. of Agric., and various California writings. A recent full account of Smyrna Figs, by J. Burtt Davy, is in the Pacific Rural Press, Nov. 25, 1899. L. H. B.

Fig Culture in the Carolinas.—Enthusiasm in regard to Fig culture in the eastern part of the country has been very much dampened by the two or three severe winter spells of late years. Several methods of winter protection have been tried. A plan, which was so successful in northern Maryland, of bending them down and mounding with earth, will not do in North Carolina and southward. If the soil froze up and remained frozen, as it does in northern Maryland, it would be all right. But here there is more warm than cold weather in winter, and during the warm and wet spells the buried branches simply rot, and are worse off in the spring than those to which no protection is given. In normal winters most varieties of Figs get along very well without protection, but when the mercury drops to 10° or 12° above zero, even if the wood escapes, the early crop is destroyed. When the trees are branched in bush form from the ground, the best protection here is to bend them down to the ground and cover thickly with green pine boughs. If in standard shape and kept pruned so, the best method of all is to thatch the entire tree with corn stalks and broom sedge, placing a thick layer of corn stalks upright around the body of the trees, and tying them in closely at the top and banking the earth up against the butts, and then to thatch every limb separately with broom sedge, tying as we go. The trees come out in better shape from this than from any other mode of protection. There is a great deal of difference in the natural hardiness of the different varieties. The Celestial is one of the hardiest. Doree Narbus is reputed the hardiest in California, but was killed outright here. Next to Celestial comes the Brown Turkey, the Brunswick and Pegustrata. Adriatic is too tender to be of any use in North Carolina. Station Smyrna, from the California Station, seems to be almost as hardy as the Celestial. A few years ago Brown Turkey Figs were plentiful in the Raleigh market at 75 cts. per bushel, but for two or three years past hardly any have been offered. W. F. Massey.

Fig in California.—The Fig, a native of southwestern Asia, is one of the most ancient, beautiful and valuable of all fruit trees, and its more general culture in suitable districts of the United States is much to be desired. There are several recognized botanical varieties of the Fig (*Ficus Carica*), of which the following can be noted: (1) *Ficus Carica*, var. *sylvestris*, the wild Fig of Asia Minor, commonly called the Capri Fig. The fruit of this kind is not edible, but the little Fig wasp (*Blastophaga psenes*) breeds therein. (2) *Ficus Carica*, var. *Smyrniaca*, the true Smyrna Fig, which does not mature its fruit unless the flowers are cross-pollinated by hand or by the friendly agency of the Blastophaga, which pollinating is termed caprification. (3) *Ficus Carica*, var. *hortensis*, the common Fig of gardens and orchards. (4) *Ficus Carica*, var. *intermedia*, a type of Fig which matures one crop, but needs cross-pollination for the main, or second crop.

The last three of the above four botanical varieties of Figs, especially the third, have become the parents of many horticultural forms. The best drying Figs of commerce belong to the second class, *Smyrniaca*, while nearly all of the fine table and preserving sorts are varieties of *hortensis*. Nearly all cultivated varieties of Figs yield three crops, more or less distinct according to the variety, the location and the season. The second crop is the important one, but the first crop in some varieties is much esteemed for table use. Ripe Figs can be gathered in many California Fig orchards from late in July until rains and frost destroy the fruit.

Figs have been grown on the Pacific coast for much more than a century. Trees were probably at Loreto Mission, Lower California, before 1710, and reached the Alta California Missions soon after their establishment. Vancouver found Fig trees at Santa Clara in 1792. At the present time the Fig is cultivated in almost all parts of the state of California. The tree stands a range of temperature of from 18° to 120° Fahr., and the only portions of California really unsuited to its growth are certain cold or foggy districts. In the drier parts of the state it needs irrigation, as do other fruit trees. Some of the old Fig trees in California are of immense size. It is not uncommon to see trees with trunks of more than 2 feet in diameter. One tree in Stanislaus county is 60 feet in height, covers a circle 70 feet across, and has a trunk that girths 9 feet. The great Banyan-like Fig tree at General Bidwell's, Butte county, illustrated in the Century Magazine for October, 1892, has trailing or descending branches, which have taken root at many places, and the whole group now covers a circle more than 150 feet in diameter.


821. White Adriatic Fig

Varieties.—There are many horticultural varieties of the Fig, probably not less than 150 distinct sorts in cultivation under innumerable synonyms. Their classification is by shape, color of skin and color of flesh. The shape is round or turbinate in some sorts; pyriform or obovate in others. The skin varies in color in different varieties from green, through pale yellow, buff, light brown, reddish brown and purple, to black. The flesh is almost white, opaline, or various shades of red; it can be described as melting, spicy, juicy, coarse or even dry in a few old sorts which seem but a few removes from the wild. The size varies from sorts hardly as large as a green-gage plum to others that sometimes weigh 4 or 5 ounces apiece. The Fig most often planted in California came from the old Missions, and is known as California Black, a hardy and very productive sort. Properly dried it is an excellent Fig, but the dark color renders it less marketable than the white varieties. It is a very popular table Fig. The white Fig most generally planted in California is the so-called "White Adriatic," which is the "Grosse Verte" of France and the "Nebian" of Hogg. The best dried Figs yet produced commercially in California are of this variety, which does not need caprification. There is a large and increasing demand for California dried Figs, which are not yet equal in quality to the Smyrna product, but can be sold at a lower price.

The following 25 varieties of Fig are now freely cultivated in California, and extensively grown by the nurseries: Adriatic (Grosse Verte), Agen, Angelique, Black Ischia, Black Marseilles (Black Provence or Reculver), Bourjassote Blanc, Brown Turkey, Brunswick, California Black, Capri, Celeste (Celestine), Col di Signora Nero, Drap d'Or, Du Roi, Grossale, Ladaro, Negro Largo, Ronde Noire, Ronde Violette Hative, Royal Vineyard, San Pedro, Smyrna, White Genoa (Grosse Marseilles), White Ischia, White Marseilles (Petite Marseilles). The California Experiment Station has grown at various places the above 25 varieties, and, in addition, about 35 others, thus testing a collection of some 60 sorts, and these have been widely distributed for 6 or 8 years. The list includes Abondance Precoce, Brianzola, Black Brogiatto, Bellona, Bordeaux, Brown Ischia, Dalmatian, Doree Narbus, Rocardi, Rubrado, Verdal Longe, 3 varieties of Smyrna, Osborne Prolific, Pastiliere and an especially fine variety, Hirta du Japon, a medium-sized, turbinate, dark purple Fig with yellowish white flesh and high quality. This last named variety, with Angelique, Early Violet, Brown Turkey and a few others, is excellent for house culture or forcing. The best sources in France, Spain and Italy have been drawn upon for the various importations of Figs upon which these collections are based.

Acreage.—About 5,000 acres of land in California have been planted in Figs, mostly in small tracts seldom exceeding 20 acres. The leading Fig counties, as far as area is concerned, are Los Angeles, Santa Barbara, San Bernardino, Butte and Fresno, but the counties of Alameda, Santa Clara, Solano, Sacramento, Stanislaus, San Joaquin, Placer, Yuba, El Dorado and Shasta contain some of the finest groves and specimen trees.

The Smyrna Figs.—After many attempts, the true Smyrna Figs were introduced on quite an extensive scale by the San Francisco Bulletin in 1882, by the late James Shinn, and by George Roeding, of Fresno. From these different importations, California became well stocked with both the Capri and Smyrniaca types. The Fig wasp was obtained in July, 1891, by James Shinn, but the locality was unsuited to its propagation. It was again introduced at various times by the United States Department of Agriculture and by Mr. Roeding, until it now seems to be fairly well established at Fresno. The Smyrna Fig was first hand-pollinated in 1891 at Niles and also for several seasons at Fresno, producing Figs which when dried were of superior quality. In 1899 Mr. Roeding's Smyrna Figs, caprified by the little Fig wasp, bore a Fig crop. Several large orchards of the true Smyrna Figs, in various varieties, and many Capri Fig trees are ready for colonies of this useful Blastophaga, and it is hoped that a new industry can now be developed in various parts of California.

Propagation.—The Fig grows very readily from cuttings. Use well ripened wood of the previous season's growth, cut at the joint, and give them the same treatment required for grape cuttings. They will even grow from single-eye cuttings. Bottom heat is not necessary in California, where the cuttings are set in the nursery in December or January, and are ready for the orchard in a year. In the eastern states, winter-made cuttings can be started with bottom heat, or in the open air in April.

Budding is best done by the annular or ring method so useful for the chestnut and walnut. The Fig can be cleft-grafted, say in February in California, but extreme care must be taken to exclude the air. Seedlings are easily grown from the fertile seeds of the imported Smyrna Figs, and from the few fertile seeds occasionally appearing in common varieties.

Planting, Culture, etc.—The Fig tree in California requires much space, hence it is used as an avenue tree, or if in orchard form other trees are set between, to be afterwards removed. In good soil Fig trees, like walnuts, should finally stand not less than 40 feet apart.

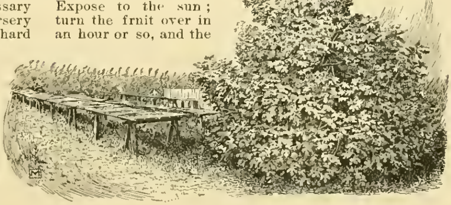
Little pruning is required for the Fig. Trees grown for table Figs are headed low, about 18 inches from the ground, to facilitate picking. Trees grown for drying Figs are headed higher, so that the ground can better be kept smooth and clean, for the Figs are usually allowed to ripen and fall. Cultivation is necessary until the trees completely shade the ground.

Figs begin to bear early in California, often the second or third year. Some trees prove barren, or very poor bearers, and must be replaced by others. Cuttings for propagation should always be taken from well-matured wood of bearing trees. The tree appears to be as long-lived as the olive, has very few insect enemies, and is not subject to disease. The fruit in some districts in some seasons ferments on the trees ("Fig-sour"). This sometimes seems to come from over irrigation, sometimes from lack of vitality, and more often occurs with very juicy and tender varieties.

Caprification.—The problems connected with Fig caprification have long been discussed, and the necessity for the process has been strenuously denied by many writers. But there is no doubt that Figs of the true Smyrna type cast their Figs unless caprified, for old trees are now growing in California and bear no crop. Cases otherwise reported prove to be of some different, or *hortensis*, variety. Fig caprification has been discussed in various papers in the publications of the State Board of Horticulture, by Dr. Eisen and others, in the publications of the Divisions of Pomology and Entomology, at Washington, and by W. T. Swingle in Science, October 20, 1899.

The true Smyrna Figs, which are of several varieties, and doubtless capable of much improvement, yield two crops, the first of which fails, because no pollen is then obtainable from the wild or Capri trees. Both earlier and later varieties of wild Figs than we now have are needed by horticulturists. The wild Fig now produces three crops, but only one is useful for caprification; the others are barren of pollen, but are necessary to maintain the Fig wasp. Only 30 Capri Figs are needed to caprify a large Fig tree, so abundant are the insects and the pollen in good seasons, and one tree of the wild Fig is sufficient for one hundred Smyrna trees. The male of the Fig wasp is without wings, but the female has wings and saw-like mandibles; she cuts her way through scales which interlock over the apex of the half grown Smyrna Fig. She loses her wings in entering, dies in the Fig, and is absorbed by the vegetable cells; if her eggs are deposited they also perish, and the continuance of the species depends upon those individuals that remain upon the wild Fig trees. The whole story is one of the most interesting known to entomologists.

Fig-drying in California (Fig. 822).—The foreign methods so far as tested in California are not practicable under labor conditions, and not entirely satisfactory in any case. Some growers let Figs fall from the trees, picking such as shrivel on the trees without dropping; others let all the Figs fall. Picking is best with the finer sorts. Allow the Figs to shrivel on the trees; pick with great care, place on slat trays, bloom-end down, and subject to sulphur fumes, if bleaching is desired. Expose to the sun; turn the fruit over in an hour or so, and the next day begin to "Fig-pull," or press each Fig between the fingers to keep it from "drying hard." In 4 or 5 days the Figs can be placed in the shade, and in a day or two "dipped" in boiling water, to further reduce the coarseness of the skin, close the pores and color the fruit.



822. Young Fig tree, and Fig-drying in open air California

Subsequent sweating and "processing" vary much as with prunes, raisins and other dried fruits. Exceeding care, cleanliness and long experience are all-important in the production of a high-grade article.

The dried Fig crop of California is large, and increasing. In 1886 the total product was but 100,000 pounds. In the 5 years ending with 1899 it was 14,945,000 pounds, an average of 2,989,000 pounds per annum. White Adriatic, Black Californian and to a small extent White Marseilles were the varieties producing this amount.

Culture in the eastern states.—The culture of the Fig in the northern and middle parts of the United States is extremely interesting, but is essentially different from California methods, or even from those prevailing in the southern states. The tree is not hardy enough to endure the climate excepting when grown as a bush, and protected in winter, usually by covering it with several inches of soil. In the southern middle states a heavy covering of straw or of evergreen branches is often sufficient. The first crop of fruit is all that can usually be expected in the extreme north; the second crop sometimes ripens in the middle states.

South of Virginia, many varieties of Fig are readily grown in the open ground. The experiments of Berckmans, Massey, Normand, Reasoner and others plainly show that the Fig is well adapted to a large area of the southern states, but chiefly for table use—not for drying, which seems to require a less moist summer atmosphere. The Fig cannot be carried far to market in a fresh state, and therefore its extended cultivation to supply local demands will long be profitable. Even in California the fruit markets are with difficulty kept supplied, and many large towns seldom have fresh Figs on the stands.

Charles H. Shinn.

FIG. **Adam's F.** is *Musa paradisiaca*. **Barbary F.**, *Opuntia vulgaris*. **Devil's F.**, *Argemone Mexicana*. **Hottentot's F.**, *Mesembryanthemum edule*. **Indian F.**, *Opuntia vulgaris*. **Keg F.**, *Diospyros Kaki*. **Pharaoh's F.**, *Sycomorus antiquorum*.

FIG-MARIGOLD. *Mesembryanthemum.*

FILAGO Germanica, the Cotton Rose, is a cottony annual plant somewhat like Leontopodium, which is now and then collected by tourists and dyed like immortelles. It was called *Herba impia* by the old herbalists, because a new generation of clustered heads rises out of the parent cluster as if undutifully exalting itself. Fully described in botanies.

FILBERT. Old World species of *Corylus*.

FILIPÉNDULA. See *Ulmaria*.

FINGER GRASS. Species of *Chloris* and *Panicum*.

FIORIN. *Agrostis stolonifera* and *alba*.

FIR should not be used to mean anything outside the genus Abies, but popularly it includes many trees known to nurserymen and others as Picea. Fir is also used loosely and inaccurately to include conifers of other genera.

FIRE-CRACKER, FLORAL. See *Brevoortia*.

FIRE-ON-THE-MOUNTAIN. *Euphorbia heterophylla*.

FIRE-PINK. *Silene Virginica*.

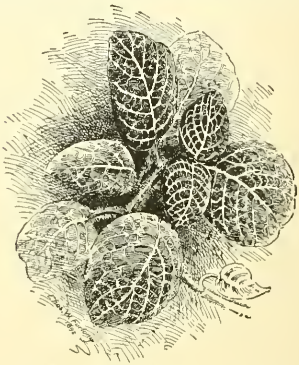
FIRE-PLANT is *Euphorbia heterophylla*.

FIRE-WEED. *Epilobium angustifolium* and *Erechtites hieracifolia*.

FISH-GRASS. See *Cabomba*.

FITTÒNIA (Elizabeth and Sarah Mary Fitton, authors of "Conversations on Botany," and friends of Robert Brown). *Acanthàceæ.* Three species of low-growing Peruvian herbaceous perennials, valued for the brilliant variegation made by red or white venation of their large, heart-shaped lvs. Fls. borne singly in the axils of the overlapping bracts, which form a peduncled, terminal spike; calyx segments linear-bristly; corolla tube slender; lip long, narrow, shortly lobed at the apex.

Fittonia argyroneura (Fig. 823) and *F. Verschaffeltii* are among the showiest and most satisfactory of tropical trailing plants that are grown for their foliage. Heat, moisture and shade are the main factors in their culture. They are standard plants in all the finer collections, and require a closer atmosphere than that of the ordinary living room. They are chiefly grown in wide, shallow pans on wire frames filled with moss and peat, some sand, and a little very finely rotted manure. They can be trusted with the most conspicuous position, as they are always on dress parade. They look well on a corner, with the pan tilted up somewhat so that some of the foliage may hang down. It is a good plan to place the pan on a small inverted saucer in a large saucer of water chiefly for the sake of a continuous supply of moisture, but also to foil the slugs, which are about the only enemies of these fine plants. A fine, large specimen can be quickly and easily secured by the use of a number of small plants. As fast as they grow they can be pegged down in their porous rooting medium. If a specimen has to be neglected for a long while it can be quickly renewed by covering with a little soil the bare portions of stem and pegging them down.



823. Fittonia argyroneura (×¼).

Fittonias are also amongst the finest elements in "pyramids" or mounds along with Philodendrum, *Cissus discolor*, *Episcea cupreata*, Nephthytis and Selaginellas. There is often a bare, unsightly space under the benches that can be transformed into a tangle of tropical creepers by the use of such plants. A board can be placed slanting toward the walks and covered with rotten stumps, chunks of peat, and moss for the plants to run in. The open borders near the walks have hardly good enough drainage. They can also be pegged down in mossy coverings for tubs of palms, as they can stand unlimited watering. On the whole, they are ideal plants for tropical conservatories, and it would be hard to overstate their merits.

A. *Habit erect: height 1½ ft.*

gigantèa, Linden (*Gymnostàchyum gigantèa*, Hort.). Subshrubby, branching: stems reddish violet only between the joints, with 4 ranks of silky, white, erect hairs: lvs. opposite, elliptical, not notched at the base, with 2 ranks of hairs, tapering more than in the other species, dark, shining green; veins carmine-red: fls. pale, with a reddish brown band in the middle of the side and upper lobes, and a dark yellow spot in the middle of the lower lip. R.H. 1869, p. 186. I.H. 16:611.

AA. *Habit trailing: height about 6 in.*

B. *Veins red.*

Verschafféltii, E. Coëm. (*Fittonia* and *Eranthemum rubronervum* and *rubrovenosum*, Hort. *Eranthemum* *rubro-venium*, Veitch. *Gymnostachyum Verschaffeltii*, Lemaire). Lvs. ovate, notched at the base, dull green, often yellowish, veined carmine. F.S. 15:1581. I.H. 10:372. Var. **Pèarcei** (*F.* and *G. Pèarcei*, Hort.). Lvs. light, bright green; veins light, bright carmine; under surface somewhat glaucous. Var. **Dàveana** (*F. Dàveana*, Hort.). Once sold by J. Saul. "Foliage with light center, bordered very dark green." More robust than the type and with veins of stronger red.

B. *Veins white.*

argyroneùra, E. Coëm. Lvs. dark, shining green. F.S. 16:1664. Gn. 36, p. 527, and 2, p. 319.—The velvetiness of the upper surface of *F. Verschaffeltii* is due to large, projecting epidermal cells with an apical nucleus. Instead of these characteristic cells, *F. argyroneura* has small cells and conical hairs, which are partitioned off and have tubercles at the base.

Robert Shore and W. M.

FIVE-FINGER. *Potentilla.*

FLACOÚRTIA (Etienne de Flacourt, 1607–1660, General Director of the French East India Co., Governor of Madagascar and author of a history of Madagascar). *Bixàceæ.* This genus contains a spiny hedge and fruit plant called the Rambustan or Governor's Plum. It is a dense-leaved plant with purple fruits, grown only in S. Calif. The whole order, with its 29 genera and 160 species, contains no plants of garden value except a few Azaras and *Aberia Caffra*, another tropical spiny hedge and fruit plant. Lvs. short-stalked, toothed: fls. small, diœcious, in small racemes or glomes; sepals 4–5, scab-like, ciliated, overlapping; petals none; stamens many; styles 2 to many: ovary 2–5-celled: fr. a berry. In Aberia the sepals scarcely overlap. *F. Ramontchi*, L'Hérit., the Governor's Plum, comes from India, Malaya and Madagascar.

F. Franceschi and W. M.

FLAG, *Iris.* **Cat Tail F.**, *Typha.* **Corn F.**, *Gladiolus.* **Sweet F.**, *Acorus Calamus.* **Yellow F.**, *Iris Pseudacorus.*

FLAME-FLOWER. *Kniphofia aloides.*

FLAX. As fiber plants are treated only incidentally in this work, the reader is referred to certain publications of the Department of Agriculture. Report No. 10 of the Office of Fiber Investigations contains 80 pages, published in 1898. Farmers' Bulletin No. 27, published 1895, is a summary in 16 pages. Another summary may be found in the Year Book for 1897. Flax is occasionally cult. for ornament, and is therefore described under *Linum.*

FLAX, False, is *Camelina.* **New Zealand F.**, *Phormium tenax.* **Toad F.**, *Linaria.*

FLEABANE. *Erigeron.*

FLEMÍNGIA (John Fleming, Pres. Medical Board of Bengal; author of "A Catalogue of Indian Medicinal Plants and Drugs"). *Leguminòsæ.* This genus includes two shrubs, cult. only in S. Calif. and S. Fla. Herbs, subshrubs or shrubs of the Old World tropics, erect, prostrate or twining: lvs. mostly with 3 digitate leaflets, rarely 1; stipules none: fls. red or purple and mixed with yellow, in crowded racemes or panicles; stamens 9 and 1: pod short, oblique, swelled, 2-valved: seeds spherical.

congèsta, Roxb. Shrub, somewhat erect: lfts. broadly lanceolated, the side ones 2-nerved, middle one 3-nerved: racemes axillary, dense, shorter than the leaf-stalks. India. "Rich, ornamental foliage: fls. purple."—*Franceschi.*

F. strobilifera, R. Br., has been introduced recently in S. Fla. It has drooping fascicles of white pink-striped fls. and large yellow bracts: lvs. simple, ovate, acute: plant shrubby.

FLOATING HEART. *Limnanthemum.*

FLORA'S PAINT BRUSH is a common name for *Emilia flammea.*

FLORICULTURE. The cultivation of plants for ornamental purposes is known as Floriculture. The work is limited largely to herbaceous or small plants, and is confined for the most part to greenhouses and other glass structures. In this country Floriculture did not assume much importance until about 1825. Prior to that time a number of firms were devoting considerable attention to the work, but their field was so broad that they could hardly be called florists. After the year named, affairs generally were in a more settled condition, and there began to be a marked increase in all lines of business. The eastern states were rapidly increasing in population and wealth, especially near Boston, New York, Philadelphia, Baltimore and Washington, and with this increase came a demand for flowers.

Philadelphia was one of the first cities in which Floriculture assumed importance. This was due to the fact that a great deal of wealth had accumulated there, and the people therefore had time and opportunity to cultivate a love for the beautiful in the shape of flowers. Philadelphia had advantages also due to climate and to the active work of several horticultural societies which were organized early, and did much to extend the interest already awakened. Boston was also a center for Floricultural work, and many fine establishments were located in that vicinity. New York was behind most of the other cities, largely because the time of her people was very fully occupied with business affairs.

From 1830 to 1840 much progress was made in all branches of the work. Rapid improvement in greenhouse construction had been brought about, and many facilities were afforded growers for heating and ventilating their greenhouses, which materially aided in the production of better stock. The change from flues to hot water was the most important innovation of the period. About 1850 other improvements which had a marked influence on the industry were made in greenhouse construction. Chief among these may be mentioned the abandonment of movable sashes and the substitution of fixed roofs, the use of larger-sized glass, and the bedding of the glass in putty instead of placing the putty on the outside. These improvements may appear trivial at the present time, but they marked an important advance in greenhouse construction. In those early days the principal plants grown for cut-flowers were camellias, tuberoses, heliotrope, bouvardias, etc., and for bedding and for ornamental and other purposes, fuchsias, geraniums and bulbs of various kinds.

By 1860 commercial Floriculture had assumed considerable importance. The establishments in the main, however, were devoted to many diverse lines of work; that is, the commercial florists of the time were required, through the demands of the market, to grow not only cut-flowers, but also plants for ornament and for bedding. Things went on for the most part in this way until after the civil war, when there began an era of plant-growing, which continued until about 1868 or 1870. At this time plants of all kinds were in demand in preference to cut-flowers, consequently many new establishments were started, and these devoted practically all their space to growing ornamental stock. The rose, which had come into general use as early as 1850, was rapidly superseding the camellia. Carnations were also being grown to a considerable extent, and much attention was devoted to lilies and other bulbous crops, such as hyacinths, tulips, etc. About this time violets began to attract attention, and the introduction of the variety Marie Louise gave an impetus to the work which was destined to have a marked influence on an important phase of Floricultural development.

About 1870 there was a noted increase in the demand for cut-flowers, and in a short time this business assumed important proportions. Soon there was a rush to change from the growing of plants for ornament and for bedding to the forcing of roses, carnations and other crops for the flowers alone. This demand for cut-flowers had an important bearing on methods of culture and the construction of houses, and it was found necessary in many cases to modify existing methods and to change the construction to suit the demands of the time.

During the past twenty-five years the demand for cut-flowers has been constantly increasing, and, while the same is true of plants, the demand for flowers has been proportionally greater. As a result of the increasing desire for flowers, there have been developed methods of handling them which prior to 1870 were unknown. The best growers have found it necessary to specialize in order to keep pace with the demands of the trade for the highest grade of flowers, hence we have specialists in rose-growing, carnation-growing, violet-growing, etc. The immense number of flowers produced required special methods for handling, and therefore there have been developed wholesale commission houses, retail stores, exchanges, auction sales, and other arrangements for quickly disposing of stock. See *Cut-Flowers*.

As already pointed out, the industry has assumed the most importance near large cities, owing to the great demand in such places for both plants and flowers. The cities which now lead in the handling of stock of this kind are New York, Chicago, Boston and Philadelphia. The greatest amount of glass devoted to Floriculture is found in New York, Illinois, Pennsylvania and New Jersey, in the order named. There are now probably not less than nine or ten thousand floral establishments in the United States, representing a money value of from twenty-two to twenty-three million dollars, and giving employment to not less than fifteen thousand people. The annual output from these establishments, considered from the retailer's standpoint, is in the neighborhood of twenty-five million dollars. Of this amount from twelve to fourteen millions are annually spent for flowers and the remaining ten or twelve millions for plants.

The rose is the most important cut-flower grown, and there are not less than six million dollars' worth sold every year in this country. This means an annual production of fully one hundred million flowers. The carnation is the second flower in importance. It is estimated that there is sold annually fully four million dollars' worth of this flower, representing a production of not less than one hundred million flowers. The violet is third, with a production of seventy-five million flowers, valued at seven hundred and fifty thousand dollars. Chrysanthemums are only a part-year crop, but they represent a value of half a million dollars. Of miscellaneous flowers, such as lilies, hyacinths, tulips, orchids, etc., there are probably between two and three million dollars' worth sold annually. The varieties of roses, carnations and chrysanthemums grown for flowers are constantly changing, but the varieties of violets have changed but little in twenty years.

The number of plants sold, including palms, ferns and bedding stock of all kinds, will probably exceed one hundred millions, estimating that the average sized pot for the country as a whole is 3 inches, and the average price 10 cents per pot.

To properly conduct the fine retail establishments in our cities, a large force of employés is required. These establishments are carried on with every attention to methods for attracting and holding trade. The stores are models of elegance, and their methods of handling the crops, such as having special decorators, show windows, fine delivery wagons, messenger boys, etc., makes the business expensive.

As a rule, florists are such busy people that few of them have time to write books on their specialties, consequently the works on this industry can be counted on the fingers of one hand. The first work of importance was Peter Henderson's "Practical Floriculture," which was issued in 1867. New editions of this were issued from time to time, but nothing further was published until 1893, when M. A. Hunt's "How to Grow Cut-Flowers" appeared. More recently we have Taft's "Greenhouse Management," which covers the whole field of plant-growing under glass, and also the "Florists' Manual," by William Scott.

B. T. GALLOWAY.

FLORIDA HORTICULTURE. Fig. 824. The history of Horticulture in Florida dates from the earliest settlements, and even prior to that period the aborigines carried on a desultory plant growing. The peculiarity of the soil, however, prohibited the extension of this work except in a few isolated places. It was necessary to introduce commercial fertilizers before Horticulture could make rapid progress in this state. Up to the time of commercial fertilizers, it was thought that the hammocks were the only places capable of raising fruit, the rest of the arable land being so sandy and wanting in plant-food that remunerative crops could not be grown on it excepting after it had been "cow-penned."

Such a soil, containing often over 90 per cent sand and insoluble matter, at first sight would seem to be absolutely worthless for Horticultural purposes, but with the advent of the new Horticulture it becomes the ideal soil. We have here a lodgment for plants in which occurs no material that will prove deleterious to the crop, and all we have to do is to add to it the material that will cause the plant to grow to the necessary size and produce fruit of the desired quality. Beautiful thin-skinned oranges grow only on land properly fertilized and not on soil impregnated with great quantities of organic nitrogen, i.e., fertile lands.

CIRCUMSCRIBED AREAS.—In building up of the land from the ocean bed, referring especially to peninsular Florida, the wind and waves have sorted the particles to some extent and have elevated various portions more than others. The separation of the larger particles of sand from the finer, with a porous substratum, has produced what is called a "scrub." The railroad surveys indicate that the maxim elevation in peninsular Florida is about 150 feet. Thus it happens that, although this land is thirsty, it is rarely or never spent of its capillary moisture. The areas of scrubs may vary in size from a few acres or even less to many thousands, but they are always sharply defined, having a specialized flora. The soil in a hammock is of a finer texture and is not infrequently underlaid by clay. It often occurs that land of this texture is only a few feet above sea level, or it may be elevated and rolling, but is always covered with a good growth of hard wood or of cabbage palmetto, or both. This class of land has long been desirable for Horticultural purposes, and is still regarded as valuable; these regions are more or less isolated, and vary in extent. Such land usually contains sufficient fertility to raise several crops of vegetables. Flat-woods land is usually level, varying in fertility from 96 per cent of sand and insoluble matter to that which will produce a crop of tomatoes. This class of land comprises about nine-tenths of the land of the Peninsula. With proper treatment it raises good crops and is capable of remarkable improvement. The characteristic plant of this land is the long-leaved pine (*Pinus palustris*).

HORTICULTURAL REGIONS.—The foregoing discussion relates to the state independent of latitude and climate. The state is also divided into four regions, according to climate and latitude: (1) western Florida, that portion of the state lying west of the Aucilla river; (2) eastern Florida, that portion of the state lying between the Aucilla river and a line drawn from the mouth of the St. John's river to Cedar Keys; (3) central Florida, that portion of the state lying between eastern Florida and southern Florida; (4) southern Florida,—including the counties of Brevard, Dade, Monroe, Lee, DeSoto and Manatee.

CITROUS FRUITS develop best on hammock and flat-woods land, preferring the cabbage palmetto hammocks or a hammock containing a mixture of palmetto and hard wood. The lime (*Citrus Medicus* var.) alone does well on the shell and coquina lands of southern Florida. The lemon is the best stock for high flat-woods land. For western Florida the Satsuma orange is the best variety. For eastern Florida varieties that mature their fruit before Christmas may be planted. In central Florida all the varieties of Citrus do well, especially toward the south and in protected localities. The following sweet oranges do especially well in southern Florida: Centennial, DuRoi, Exquisite, Hart's Late, Higley's Late, Homosassa, Jaffa, Madam Vinos, Majorca, Maltese Oval, Nonpareil, Parson Brown, Pineapple and Thorpe. Of the Mandarin group,—China, Cleopatra, Dancy's Tangerine, Japan Tangerine and King. Of the Bitter Orange group,—Phillips Bitter Sweet. Of the Pomelos,—Aurantium, Hart, Josselyn, Seedless and Walter. Of the Kin-Kans,—Marumi and Nagami. Of the Citron group,—Lyman, Lemon and Orange. Of Shaddocks,—Blood, "Forbidden Fruit" and Mammoth.

PEACHES grow in all sections, preferring hammock or rolling flat-woods land or even level flat-woods land if perfectly drained, but the varieties best adapted to different regions vary considerably. Among those adapted to western Florida we have Alexander, Early Cream, Elberta, Florida Crawford, General Lee, Imperial and Powers' September. For eastern Florida,—Angel, Bidwell's Late, Colon, Ferdinand, Honey, Imperial, Oviedo, Taber, Triana and Waldo. For central Florida,—Angel, Bidwell's Early, Bidwell's Late, Maggie, Peen-to, Waldo and Yum Yum. For southern Florida,—Angel, Bidwell's Early, Bidwell's Late, Maggie, Peen-to, Yum Yum, and others.

Plums, as a whole, are adapted only to western and eastern Florida, preferring hammock and flat-woods land. Burbank does well in the western section. In the eastern section Babcock, Botan and Burbank do well.

Pears.—Kieffer, LeConte and Smith pears do well in western and eastern Florida on hammock or flat-woods land.

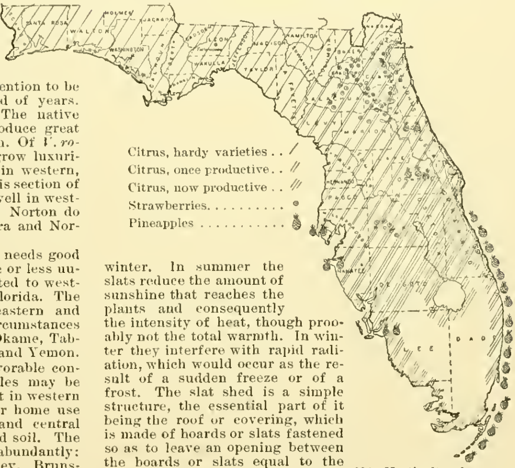
Grapes grow rapidly, but need careful attention to be kept in good bearing condition for a period of years. Hammock land is preferable for them. The native varieties grow to an immense size and produce great quantities of fruit with a minimum attention. Of *V. rotundifolia*, the Scuppernong and Thomas grow luxuriantly in all sections. Flowers grows well in western, eastern and central Florida. Of the true Vitis section of this genus, Cynthiana, Ives and Norton do well in western Florida; Cynthiana, Ives, Niagara and Norton do well in eastern Florida; Cynthiana, Niagara and Norton in central Florida.

Kaki (Japanese Persimmon).—This fruit needs good hammock land or well drained high, or more or less undulating flat-woods land. It is better adapted to western, eastern and central than to southern Florida. The following varieties do well in western, eastern and central Florida, and under most favorable circumstances in southern Florida: Costata, Hyakume, Okame, Taber's No. 129, Tane-nashi, Tsuru, Yeddo-ichi and Yemon.

Miscellaneous Tree Fruits.—Under favorable conditions Jennings and Red Astrachan apples may be fruited in western Florida; Santa Fé apricot in western and eastern Florida. Figs do fairly well for home use and for canning or candying in eastern and central Florida. They need a compact, fine-textured soil. The following varieties fruit more or less abundantly: Black Ischia, Blue Genoa, Brown Turkey, Brunswick, Celestial, Green Ischia, Lemon and White Marseilles.

Mulberries will grow on hammock or good quality of flat-woods land in all sections of the state. The following varieties have given good crops: Downing, Hicks and Stubbs. Pomegranates make a more or less ornamental fruit. Acid, Purple and Sweet do well in western, eastern and central Florida. Pecans do best on low hammock land, especially in western Florida. They succeed well in eastern and central Florida, but have not been introduced into southern Florida sufficiently to permit definite statement.

Strawberries.—The growing of this crop is controlled largely by efficient and reasonable transportation. If the crop cannot be placed upon the market promptly it is worthless. The development of this industry is, therefore, coincident with that of efficient and reasonable railroad transportation. Probably nine-tenths of the fields of the state are planted on moist flat-woods land, or what is locally known as gall-berry flats. Such land is cleared and thoroughly drained by means of open ditches. On such land strawberries begin to ripen in January and continue until May or June if properly cultivated, though the season of profitable shipment rarely extends beyond the middle of April. Especially prepared refrigerator cars, so constructed that the ice tank is filled from the outside, the water melted from it carried off without entering the car, keeping the apartment occupied by berries dry and cool in transit, are now carried by some railroads on express trains. The plants are usually set out every year, in August, September and October, and bear a good crop the following spring. The most successful strawberry growers continue to cultivate a portion of the old field to secure new plants to be used the following fall for planting out the new field. Cloud, Newnan, Lady Thompson and Wilson do well in western, eastern and central Florida.


SANTA ROSA
WALTON
HOLMES
JACKSON
WASHINGTON
GADSDEN
LEON
WAKULLA
JEFFERSON
MADISON
HAMILTON
TAYLOR
BAKER
DADE
Citrus, hardy varieties . . /
Citrus, once productive . . //
Citrus, now productive . . ///
Strawberries. . . . . ●
Pineapples . . . .

824. Horticultural zones of Florida.

Pineapples find their most congenial habitat on scrub land. Soil from pineapple fields contains a large per cent of sand and insoluble matter,—as high as 98 per cent. The land must be well drained, free from any standing water, even during the rainy season. The most extensive pineapple area is located on the sand hills near the coast. The character of the vegetation and physical condition of these hills or dunes is essentially that of the scrub land of the interior. The slat sheds or pineapple sheds, which are constructed to afford a half shade, serve a good purpose in summer as well as in winter. In summer the slats reduce the amount of sunshine that reaches the plants and consequently the intensity of heat, though probably not the total warmth. In winter they interfere with rapid radiation, which would occur as the result of a sudden freeze or of a frost. The slat shed is a simple structure, the essential part of it being the roof or covering, which is made of boards or slats fastened so as to leave an opening between the boards or slats equal to the space covered by them. These vary in size from a common plastering lath to boards 4 inches wide. The height of the covering above the ground varies from 6 feet to rarely more than 10. The most extensive fields are located in southern Florida. Smaller areas have been planted in central Florida; nearly all of these are protected by sheds, some of the sheds being so constructed that the roof may be closed completely. The islands or keys underlaid with coraline breccia form one of the most suitable habitats for this plant, while the low, fertile islands or keys are worthless for a pineapple plantation. Red Spanish is cultivated more extensively than all the other varieties combined. It is a hardy variety, and one suited to extensive planting with a minimum amount of attention. For extensive culture Egyptian Queen, Porto (Puerto) Rico and Ripley Queen do well generally. Smooth Cayenne is promising, because not spiny. The total amount of fruit produced annually varies considerably, but has probably not exceeded 100,000 whole barrel crates. This, however, is only a fraction of the possibility and probability of pineapple growing in Florida.

Bananas are cultivated only for local markets, but form a source of considerable revenue to a number of plantations. The land best adapted to them is a low, moist hammock or a bay head, especially such soil as is composed largely of muck. Baraçoa (Red Jamaica), Cavendish, Golden, Hart's Choice and Orinoco ("Horse Banana") are leading varieties in southern Florida.

Guava.—The guava has attained considerable importance, though as yet it is not cultivated extensively. Plantations exist in various portions of the state, but the greater quantity used in canning and for jelly is collected from uncultivated or from originally native growth. The native varieties grow well on any fertile soil that is well drained. Fertile soil on coral breccia is a favorite spot for the wild guava. The most desirable varieties are the common native guava, White Winter, Cattley and Chinese. The native varieties yield the bulk of the fruit used. The Cattley and Chinese do well in central and southern Florida, while the White Winter and native varieties grow to greatest perfection in southern Florida.

MANGOES have not been grown extensively for northern markets. The greatest difficulty has been that of securing trees of unquestionable value for setting out a grove. Since the difficulty in the way of grafting and budding has been overcome, the groves will multiply rapidly. Up to the present time the local markets have demanded more fruit than has been supplied them. Well drained first-class flat-woods land and fertile high hammocks furnish good soil for mangoes. Apricot and No. 11 (Apple) are favorite varieties. They are grown mostly in southern Florida, though fruited in southern portions of central Florida.

COCOANUTS are confined to southern Florida and along the seacoast. While the trees continue to grow when transplanted to the higher lands, they need the low, moist lands of the coast for fruiting and for highest development.

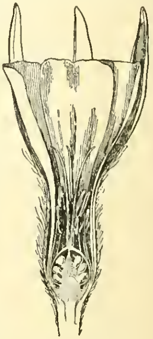
The AVOCADO PEAR has entered the markets to some extent. The soil should be like that for mangoes. Their cultivation is confined to central and southern Florida.

VEGETABLES.—There are several classes of soils upon which vegetables are grown extensively; viz., hammock, flat-woods, the low islands around the coast, and the marl or drained lands. The low hammocks, especially those composed almost exclusively of cabbage palmetto, produce the largest crops and probably the largest profits, while flat-woods land is probably more extensively cultivated than any other. In a general way all the classes of land mentioned above are capable of growing most or all of the vegetables occurring in the markets. Certain vegetables show a general preference for certain classes of land. A high hardwood hammock grows beans, beets, cabbage, cauliflower, collards, eggplant, Irish potatoes, lettuce, watermelons, muskmelon, onion, okra, English peas, pepper, radish, squashes, rutabaga, tomato and sweet potato well; though first-class flat-woods land grows cabbage, cauliflower, eggplant, lettuce, watermelon, muskmelon, onion, tomato and sweet potato to greater perfection. Low cabbage palmetto hammocks grow beets, cabbage, cauliflower, celery, cucumbers, lettuce, nutmeg melons and tomatoes to best advantage. The low islands around the coast have areas varying in size from a few square rods to many acres in extent,—sometimes reaching a mile in length of unbroken rows. The most important crops grown on these islands are beans, eggplant, peppers and tomatoes. The marl or drained lands of the southeast coast raise principally tomatoes, peppers, eggplant and okra. P. H. ROLFS.

FLORIDA ARROW ROOT. *Zamia integrifolia.*

FLORIDA SWAMP LILY. See *Crinum Americanum.*

FLORISTS' FLOWERS. This term is considerably used in England to include a group of plants that number their horticultural varieties by the hundreds, and in which the original species or types are no longer cultivated, or else cultivated merely for their interest as prototypes. The list includes 40–50 groups of plants, or even less. In America the term florists' flowers is little used, and is mostly restricted to certain cut-flowers of great importance to florists, without regard to whether their varieties are numerous or not. Thus, the calla lily, Easter lily, heliotrope, lily-of-the-valley, Marguerite, mignonette, sweet alyssum and tuberose are of considerable commercial importance to florists, but they are not extremely prolific in varieties. Inasmuch as the cut-flower trade has been greater than the plant trade in America, the American florist hardly thinks of the following plants as florists' flowers: azalea, calceolaria, cineraria, fuchsia, geranium, gloxinia, pelargonium, primula, nor such old-fashioned favorites as *Anemone coronaria*, auricula, camellia, polyanthus and ranunculus. The English writers often speak of the dahlia as a florists' flower, and sometimes also the other very variable summer bulbs, as cannas, gladiolus, and perhaps lilies, though the American florists sell comparatively few flowers cut from these plants in summer. Of hardy border plants, the following are very rich in horticultural varieties: China asters, poppies, stocks, sweet peas, tropæolum and verbena (all of which are annuals), and the following perennials: hollyhocks, pansies, peonies, phlox, pyrethrum. Others of great importance are aquilegia, campanula and eschscholzia, but these are mostly less rich in horticultural varieties. It has been said that florists' flowers are always propagated by cuttings or other asexual parts, but this definition would exclude calceolarias and cinerarias, which come fairly true from seed. In America the four most important cut-flowers are the rose, carnation, violet and chrysanthemum. Consult *Floriculture* and *Cut-flowers.*



825. Section of a flower of Corn-cockle.

Showing torus, ovary, styles, stamens, and floral envelopes.

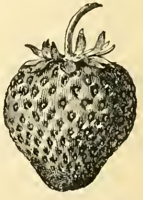
FLOWER: technically, a short stem carrying one or more specialized leaves which bear sporangia. The word is commonly applied to those flowers whose sporangial leaves are protected and made conspicuous by colored leaves. It is also popularly applied to these clusters of colored leaves even when the sporangial leaves are wanting, as in hydrangeas, snowballs, chrysanthemums and most "double flowers."

When most completely developed, a flower consists of the central short stem, the *torus*, to which the other parts (leaves) are attached. The leaves, passing from below upwards, are distinguishable into floral leaves, or the *sepals* and *petals*; and the sporangial leaves, or the *stamens* and *carpels*. The number of these parts is variable. When "double" flowers are produced, the floral leaves usually are multiplied at the expense of the sporangial ones. In Fig. 825 all these parts are shown. The ovary, showing six ovules, sits on the torus or receptacle. On the ovary are three styles. Stamens are at the side. The sepals rise above the petals.

Bracts.—The leaves growing on or near the branches of the flower cluster are usually different in form and size from the foliage; they are called bracts. Note the bracts on the carnation flower (Fig. 366). Sometimes they are bright-colored and are an attractive supplement to the flower, being popularly looked upon as a part of the flower, as in scarlet sage, flowering dogwood (Fig. 558) and poinsettia (Fig. 797). In the arum family (Fig. 79, 137, 146, 318, 734) a single huge bract envelops the entire flower-cluster. When the bracts grow very close to the torus they are almost indistinguishable from the outer floral leaves, as in the strawberry (Fig. 827) and hepatica (Fig. 834).

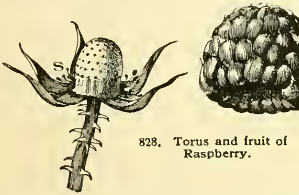
826. Flower of the Strawberry.

Showing the high torus in the center.



827. The ripened torus of the Strawberry.

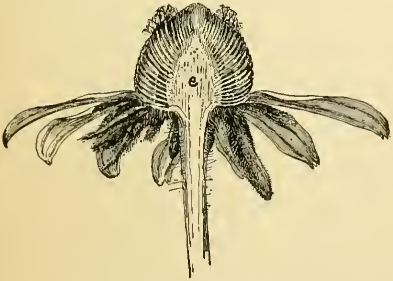
Torus.—The torus is the short stem or axis on which flower leaves are borne. It differs from other parts of the stem chiefly in that, after the rudiments of the flower leaves are formed, the intervening parts grow very little, and so do not separate the successive leaves or circles of leaves. The torus is more or less broadened or elongated to permit the suitable growth of the crowded leaves. In the strawberry it is high, dome-shaped (Figs. 826, 827); in the raspberry the torus remains (S, Fig. 828) when the little drupes are removed; in the rose it is urn-shaped, bearing the leaves on the edge and inner face; in the mouse-tail it is much elongated. When a number of flowers are crowded together their leaves are developed from a common torus, as in sunflower and chrysanthemum and other members of the Compositæ (Fig. 829). The common torus may be broad and flat, with the flowers scattered over it, as in Dorstenia (Fig. 732); or even hollow, as in the fig (Fig. 821), with the minute flowers on the nearly enclosed inner face.



828. Torus and fruit of Raspberry.

Floral leaves.—The leaves of the flower form two series; the outer protective and attractive leaves, the *floral leaves*, and the inner *sporangial leaves*. The floral leaves are usually distinguishable into an outer set, the *calyx*, and an inner set, the *corolla*. The calyx leaves, when separate, are called *sepals*, and the corolla leaves *petals*. The sepals are more or less different from the petals in size, shape and color. They are oftenest green, and usually smaller and simpler than the petals. In the bud they usually completely cover the inner leaves. The sepals and petals oftentimes do not remain distinct throughout their development, but each set grows as a single piece; a fact which has been made the basis of classification of the angiosperms. Corollas of a single piece are said to be gamopetalous (Fig. 830). The sepals are more commonly inseparate than the petals.

The apparent union of the floral leaves comes about generally in this way: On the young torus the rudiments of the sepals and petals arise as rounded knobs, which for a longer or shorter time grow independently. If they develop independently until their growth ceases, the sepals or petals are distinct, each one being separately attached to the torus. On the other hand, after the leaf rudiments have grown independently for a time, a zone of the torus, both under and between two or more adjacent rudiments, may begin to grow, lifting them on its margin. In that case, when fully grown the calyx or corolla appears as a single piece, whose free edge is more or less deeply lobed, according to the relative duration of independent development of the rudiments.

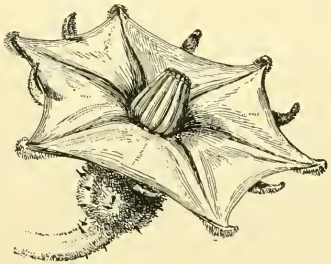


829. Section of a compositous head.
Showing the common torus at *e*.

The calyx and corolla are sometimes united. This comes about in a similar way. Each begins to develop independently; later the tissue between calyx and corolla shares in the growth and both are raised on a common base.

The form of the mature floral leaves depends largely on the relations of the flower to insects, which visit the flowers for nectar or pollen. The floral leaves are often irregular and unequal, so as to form suitable landing places, nectar glands, guides to the nectar, etc.,—all devices to facilitate the proper transfer of pollen by the visitors; e. g., the sweet pea and other papilionaceous flowers, most orchids, etc. (see *Pollination*).

The color of the corolla and adjacent parts is due to the presence in the cells of colored sap or special color-bodies. In the latter case the pigment is sometimes crystalline. It is not possible to determine without microscopic examination in which way the color is produced. Most blues are due to colored sap; many yellows and reds to color-bodies.

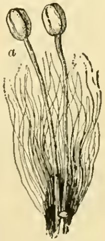


830. A gamopetalous corolla of Eggplant.

The velvety appearance of many petals is produced by the outgrowth of the surface cells into conical or dome-shaped protuberances.

The odor of flowers is usually due to the presence of volatile oils in the surface cells of the petals or sepals, or both. These oils are present in small amount only. They are sometimes found only on the outer face, or only on the inner face, or they may even be restricted to certain lines or patches.

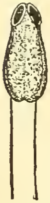
The stamens.—The stamens commonly consist of two parts, a stalk, the *filament*, bearing a larger portion, the *anther* (Fig. 831). The filament is usually rigid enough to sustain the weight of the anther, but at maturity it is sometimes so long and slender that the anthers hang as by a thread (so in grasses). The filament is sometimes so short as to seem wanting; the anther is then said to be sessile. The filaments are often united with one another or with the corolla by the mode of growth already described. In the latter case the stamens seem to arise from the corolla. Only rarely are the stamens and carpels united.



831. Staminate flower of Willow.
Showing two stamens; their anthers are at *a*.

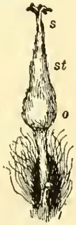
The anther is the part of the stamen which bears the spore-cases or pollen sacs (sporangia). (The sporangia are not always borne on stamens. In a few plants they are sunk in the stem of the flower.) Of these there are commonly four, more rarely two or one. When the anther was looked upon as a chambered body, the sporangia were called thecæ, or cells. Thus in descriptive botany the anther is said to be "2-celled" or "4-celled." The sporangia are partly free and partly imbedded in a mass of tissue which joins them, called the *connective*. This sometimes is extensive, and in a few plants is developed into peculiar forms to aid in pollination, e. g., in salvias.

The sporangia at maturity consist of two or four (rarely more) layers of cells, constituting a wall, surrounding a quantity of spores, the *pollen*. The inner portion of the wall consists of a layer of cells whose membranes are irregularly thickened, usually in bands, so that in drying they warp the wall, rupturing it at the weakest place. The lines of weakness are usually definitely localized, so that each anther breaks in a regular way. (*a*) The rupture may run along the whole length of the anther. In that case it commonly lies at the junction of a pair of sporangia (the left-hand groove in *a*, Fig. 831), which become confluent, so that the dehiscent anther may seem to have only two sporangia, when it really has four. The pollen is thus emptied out practically at once, though the break may begin at the top and progress to the base. Examples: lilies, grasses. (*b*) The slit may be very short and gape widely, so that a pore is formed through which the pollen is gradually sifted (Fig. 832). Examples: the heaths. (*c*) In some plants the line of breakage is curved, and the flap, so released, bends outward on drying, lifting like a hinged lid, and closing again in dampness. Examples: Mahonia, barberry, cinnamon.



832. Anther of Azalea.
Showing dehiscence by pores.

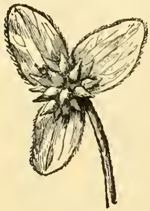
The pollen spores are, at maturity, single cells, each with a rather thick wall, which is often studded with bosses, or points, or is variously ridged. In anemophilous plants (see *Pollination*) the pollen is dry and powdery; in entomophilous plants it is usually moist and coherent. In milkweeds and orchids the whole of the pollen from each sporangium is held together in a mass by interwoven threads (Figs. 149, 513). By the time the sporangia discharge the pollen, each spore has begun a development which it completes on the stigma to which it is transferred. See *Fertilization*.



833. Pistillate flower of Willow.
Showing one compound pistil; *s*, stigma; *st*, style; *o*, ovary.

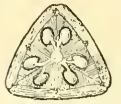
Carpels.—The carpels are the sporangial leaves which occupy the center of the flower. The number of carpels is very variable. Usually they are fewer than the floral leaves. In most flowers the carpels are united one to another to form a structure known as a *compound pistil* (Figs. 825, 833, 835, 836). When the carpels are separate, each develops as a *simple pistil*. Of these there may be one or many (Figs. 834, 837).

The pistil, if simple, first appears as a ring-like ridge about the center of the torus. If compound, knob-like rudiments of the component carpels first appear, but the growth early involves the torus between, giving rise to an elevated circular ridge. This carpellary ring gradually grows upward, partially or completely inclosing one or more chambers, in which the *ovules* arise. At a time when the ovules (which ripen into *seeds*) were supposed to be comparable to the eggs of animals, the larger chambered part of the pistil in which they are formed was called the *ovary*, a name which it still retains in descriptive botany. The pistil is often prolonged above the ovary. This part is the *style*.



834. Head of simple pistils in Hepatica.

An ovule is a fleshy sporangium, jacketed by one or two (rarely three) outgrowths from the base, the *integuments*, which almost inclose the sporangium proper (*nucellus*). Within the sporangium of the ovule, several (1 to 40) spores begin to develop. Of these, however, rarely more than one reaches maturity. This spore is never set free as the pollen spores are. It therefore acquires no thick wall, and in a section of the sporangium appears as a cavity within the delicate tissue which surrounds it. It later becomes the so-called embryo sac, within which occurs the process of fertilization (which see).



835. Section across the compound pistil of Tulip.
Showing central placenta and three-chambered ovary.

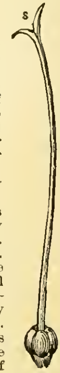
The ovules commonly arise upon certain lines or ridges which project into the pistil chamber, more rarely upon the whole interior surface of the ovary. These lines or ridges are called *placentæ*. See Figs. 825, 835, 837.

In a simple pistil there is usually but one placenta (Fig. 837). In a compound pistil the union of the carpels may be such as to produce a 1-chambered ovary, or the ovary may contain as many chambers as there are carpels (Fig. 835). In the former case the placentæ will project inward from the wall of the ovary; in the latter they will be aggregated at the center, from which they may project outward into the chambers of the ovary. When the ovules are numerous, the placentæ are often enlarged to form an adequate surface for their attachment, as in the potato and tomato (see also Fig. 837).

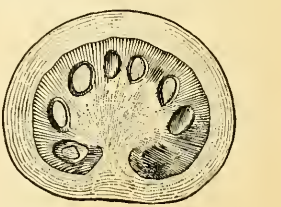
In a considerable number of plants the ovules arise upon the torus itself, a ring of which grows upward, cup-like. From the edge of this cup arise the floral and sporangial leaves, the ovules developing on its sides or base. The carpels then form a mere roof over the ovule chamber.

The style is sometimes slender and very long (up to several inches; see Fig. 836); sometimes short and thick (Fig. 833). Its length and form are adapted to the means by which the pollination of the pistil is secured. In some cases the style is practically wanting. Its interior is occupied by a tissue whose cells are pushed aside and partly digested by the growing pollen tube (see *Fertilization*). It is not infrequently traversed by a canal, a prolongation of the ovule chamber.

Some portion of the style, or when that is wanting a portion of the outer surface of the ovary itself, is adapted to the reception of the pollen spores. This receptive surface, whatever its form or location, is called the *stigma* (Figs. 833, 836). In many cases the upper part of the style is enlarged into a knob or club-shaped or lobed portion, the area of the receptive surface being thus increased. In other cases the style is elongated, and the receptive surface is a long line upon one or more sides of the elongated style. In other cases the style is much branched, as in the grasses, and these branches constitute the stigma. At the time the pollen is being discharged, the stigmatic surfaces are often covered by a sticky secretion. All of these devices are adaptations to insure the lodgment, adhesion and nutrition of the pollen spores (see *Pollination*).



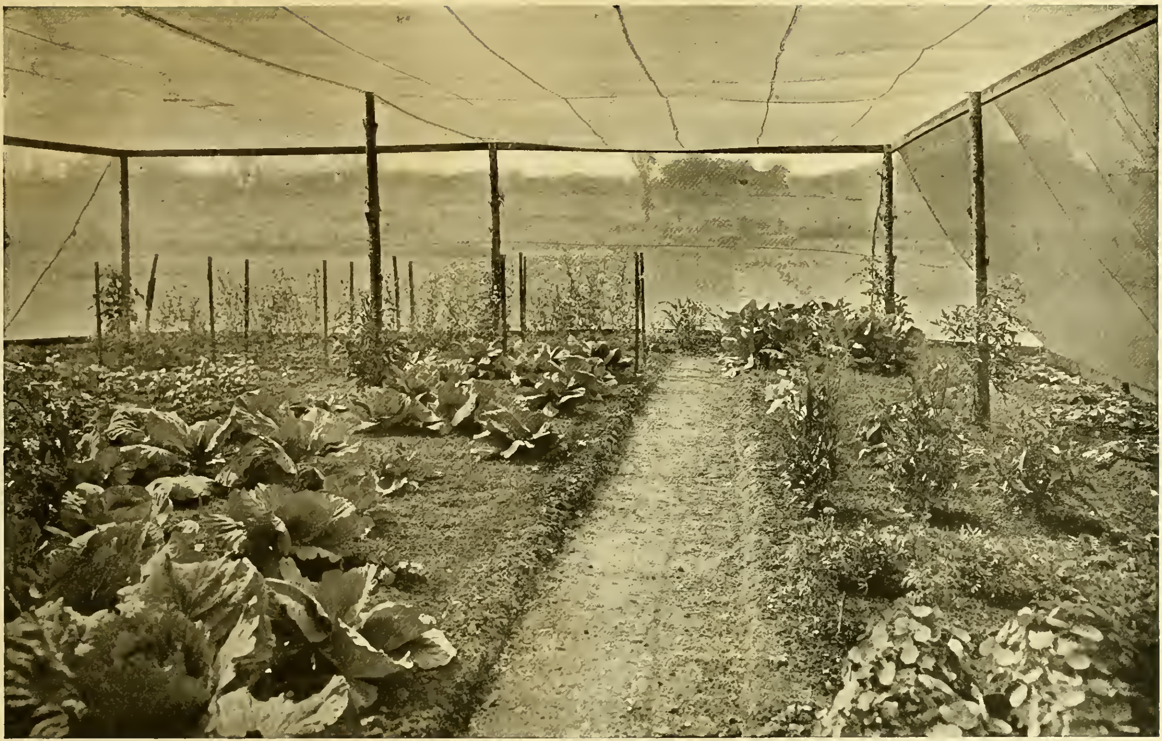
836. Compound pistil of catnip.
Showing 4-parted ovary, long style, 2 stigmas (*s*).



837. Section across simple pistil of May Apple.
Showing single placenta and ovules.

The stimulus resulting from fertilization often accelerates the growth of the pistil or causes it to resume growth if it had ceased. The various changes in size, texture, color, etc., result in the production of *fruit*.

Charles Reid Barnes.



Forcing vegetables under cheesecloth rather than under glass—now a favorite practice for plants that are started late. The cloth covering also affords protection from sun and dryness in summer

Country Life in America

"Ought to make every city reader emigrate to the country"
— *New York Sun*

THIS is the most beautiful magazine published. Its illustrations have set a new art standard for American publications. The articles not only cover in a thoroughly practical way every subject that pertains to life in the country or the outdoors, but they are also delightful and inspiring. Some of the subjects are:

The Country Home
House Building
Nature Study
Poultry
Horse Breeding
Outdoor Sports
Horticulture
Floriculture

Furnishing and Decorating
Woodcraft
Greenhouses
How to Make a Garden
Travis on Golf
Boats and Sailings
Dogs

Price, $4.00 a year; single numbers, 35 cents

THE GARDEN MAGAZINE
COUNTRY LIFE IN AMERICA
THE WORLD'S WORK
DOUBLEDAY PAGE & CO NEW YORK

P. S.—We publish three double 50-cent issues each year—the Gardening Manual in March, the House-Building Number in October, and the Christmas Annual in December, which makes the price of the twelve issues, when purchased singly, $4.65.

The Library of "Country Life in America"

THE following books bear the same tone of distinction, beauty and practical value as the magazine from which most of the material was gleaned. Much help and entertainment can be derived from them. Though each is complete in itself, these books are closely connected for outdoor people.

THE COUNTRY HOUSE *By Chas. Edw. Hooper*

A practical manual of house-building, absolutely invaluable to every one with a country place. It covers every branch of the subject in detail and treats of the garden and its furnishings in connection with the dwelling. Elaborately illustrated. *Net*, $4.00 (postage 40 cents).

HOW TO MAKE A FLOWER GARDEN

Already 5,000 printed. More than 200 photographs. *Net*, $1.60 (postage 16 cents).

HOW TO MAKE A VEGETABLE GARDEN

By Edith L. Fullerton

The only adequate book on the home vegetable garden. 250 photographs by H. B. Fullerton. *Net*, $2.00 (postage 20 cents).

DRIVING

By Francis M. Ware

An authoritative book on driving and vehicles. More than 100 photographs. Sumptuously bound. *Net*, $10.00 (postage 38 cents).

THE POULTRY BOOK

The first comprehensive work for amateur and professional alike. It was written by experts—men who have made poultry-raising a profound practical study. Superbly illustrated by Harrison Weir, F. R. H. S. Three great volumes, with 36 color plates and 636 other pictures. $13.60, *subscription*.

THE DOG BOOK

By James Watson

A magnificent companion to "The Poultry Book," covering every phase of the dog in America, with full accounts of every prominent breed; also practical information on buying and breeding dogs, their care, diseases, and the like. 240 full-page pictures. Two volumes, cloth $12.00, half leather $16.00, *subscription*). Entire work will be ready by March, 1906.

IN PREPARATION

HOW TO MAKE A FRUIT GARDEN *By S. W. Fletcher*

With about 200 photographs. *Net*, $2.00 (postage 20 cents).

THE GARDEN MAGAZINE
COUNTRY LIFE IN AMERICA
THE WORLD'S WORK
DOUBLEDAY PAGE & CO NEW YORK

The Garden Magazine

THIS magazine was begun in February, 1905, and the circulation was doubled in four months. It has been an immediate success, because it meets a well-defined need—a beautiful and practical magazine for garden lovers, devoted to every branch of flower, vegetable and fruit growing. It is full of practical information and suggestion, telling what to do each month to make the gardens and grounds more beautiful and productive.

Twenty-five departments (a partial list follows) indicate the field covered month by month.

- *The Gardener's Reminder*
- *The Vegetable Garden*
- *The Lawn*
- *Trees and Shrubs*
- *The Small Greenhouse*
- *Vines and Trailers*
- *The Water Garden*
- *Coldframes and Hotbeds*
- *The Window Garden*
- *The Back Yard Garden*

- *Roses*
- *Spraying*
- *Garden Insects*
- *The Bulb Department*
- *The Fruit Garden*
- *The Hardy Border*
- *California Department*
- *Southern Department*
- *Annual Flowers*
- *Fertilizers*

It is the first real universal gardening magazine ever published in America. Price $1.00 a year; 10 cents a copy.

THE GARDEN MAGAZINE COUNTRY LIFE IN AMERICA THE WORLD'S WORK
DOUBLEDAY PAGE & CO NEW YORK

The Garden Library

HANDY MONOGRAPHS ON SPECIFIC SUBJECTS FOR THE AMERICAN GARDEN

Ferns and How to Grow Them *By G. A. Woolson*

An authoritative little hand-book, dealing with the growing of hardy ferns, both in the garden and indoors. Profusely illustrated. Uniform with "Roses and How to Grow Them." *Net*, $1.00 (postage 10 cents).

Roses and How to Grow Them

A delightful volume of rose-growing from the home point of view, written in fresh, crisp lively style. Profusely illustrated. *Net*, $1.00 (postage 10 cts.).

IN PREPARATION

Daffodils
Ready about April, 1906
Annual Flowers
Chrysanthemums
Rhododendrons
Tulips
Fall-Planted Bulbs
Lilies
The Water-Garden

Price per volume, net, $1.00 (postage 10 cents)

THE GARDEN MAGAZINE · COUNTRY LIFE IN AMERICA · THE WORLD'S WORK
DOUBLEDAY PAGE & CO NEW YORK